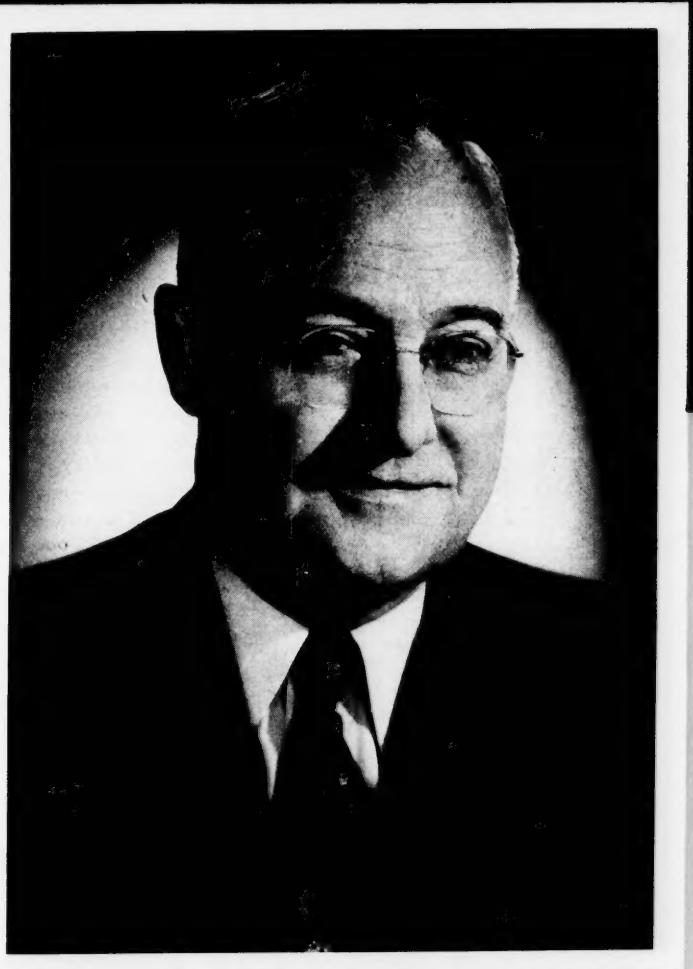
THOS. D. RADCLIFFE
1550 DEL MAR AVENUE
SAN MARINO, CALIFORNIA
L A

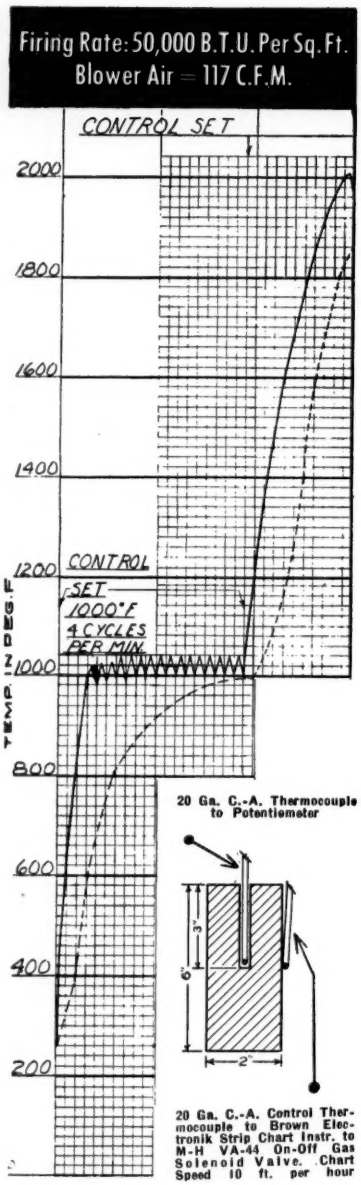
Metals Review



Clyde Williams
Member, Friend A.S.M.
(See Article, p. 4)

May 1958

INSTANTANEOUS HEAT with Holden Combustion System



INSPECT THIS PROVEN OPERATION AT OUR DETROIT PLANT

THE HOLDEN LUMINOUS WALL FIRING SYSTEM IS A METHOD OF UNIFORMLY APPLYING INSTANTANEOUS HEAT TO A PART TO BE PROCESSED.

Low Thermal Storage

A POSITIVE SOURCE OF RADIATION, TRANSFERRING MAXIMUM AMOUNT OF HEAT DIRECTLY TO THE WORK WITH NEGLIGIBLE THERMAL STORAGE IN THE FURNACE STRUCTURE. THIS MEANS RAPID STARTING, RAPID COOLING AND RAPID RE-STARTING

Flexibility

A TYPICAL EXAMPLE OF RAPID HEATING IS SHOWN ON THE GRAPH (Left). FIRING 50,000 BTU PER SQ. FT. THE FOLLOWING TEMPERATURES WERE OBTAINED—

1. Up to 1000° F. (10 min. lag 800 to 1000° F.)
2. Up to 1975° F. (3 min. lag)
3. 1975° F. to 2275° F. (3 min. lag)

CONVERSELY, THE REFRACTORY WALL HAS NO HEAT STORAGE SO WHEN GAS IS SHUT OFF AND AIR ALLOWED TO BLOW THROUGH FURNACE WALL, THE WALL IMMEDIATELY ASSUMES TEMPERATURE OF INCOMING AMBIENT AIR.

Advantages

LUMINOUS WALL—INSTANTANEOUS HEATING OFFERS—

1. Greater over all heating efficiency—more than any other type gas furnace
2. 40% less fuel consumption—average day
3. Rapid furnace heating—temperatures of 1000 to 2000° F. obtained within time cycle of 1 to 10 min. using 50,000 BTU per sq. ft.
4. Rapid furnace cooling—no refractory spalling
5. Increased refractory life—graph shows tests conducted in unit over 3 years old operated at temperatures to 2300° F. without refractory replacement

Increase your Profits

MANY INDUSTRIAL HEATING PROCESSES USE A LARGE PROPORTION OF HEAT AND TIME IN ACHIEVING OPERATING TEMPERATURES DUE TO THERMAL STORAGE IN REFRACTORY LINING. REDUCE EXCESSIVE FUEL AND LABOR COSTS WITH HOLDEN LUMINOUS WALL AND MAKE EXTRA PROFITS! WRITE FOR TECHNICAL BULLETIN 209

WHY NOT MAKE THIS PART OF YOUR FORWARD PLANNING FOR 1958?

THE A. F. HOLDEN COMPANY

3 F.O.B. Points for Holden Metallurgical Products

EXECUTIVE OFFICES AND PLANT
• 14341 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN

EASTERN PLANT
• 460 GRAND AVENUE, NEW HAVEN 13, CONN.

WESTERN PLANT
• 4700 EAST 48th STREET LOS ANGELES 58, CALIF.

Metals Review

The News Digest Magazine

May 1958
Vol. XXXI, No. 5

Ray T. Bayless, Publishing Director

Betty A. Bryan, Editor

A. P. Ford, Sales Manager

G. H. Loughner, Production Manager

Marjorie R. Hyslop, Editor
A.S.M. Review of Metal Literature

DISTRICT OFFICES

William J. Hilty
7301 Euclid Ave., Cleveland 3, Ohio
UTah 1-0200

John B. Verrier, Jr.
Fred Stanley
342 Madison Ave., Room 1228
New York 17, N. Y.
OXford 7-2667

Donald J. Walter
Victor D. Spatafora
53 West Jackson Blvd.
Chicago 4, Ill.
WAbash 2-7822

Donald J. Walter
Detroit, Mich.
UNiversity 4-3861

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio: G. M. Young, President; C. H. Lorig, Vice-President; R. H. Aborn, Treasurer; W. H. Eisenman, Secretary; G. A. Fisher, Carl E. Swartz, John Hollomon and E. E. Stansbury, Trustees; D. S. Clark, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Effective January 1959, subscription $6.00 a year in U. S. and Canada; foreign $7.50. Single copies $1.50. Entered as Second Class Matter, July 26, 1930 at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers from overseas, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

CONTENTS

Clyde Williams, Outstanding A.S.M. Member 4
M. E. I. Celebrates First Anniversary 5
Philadelphia Honors Secretary Eisenman 6

Important Lectures

Effects of Radiation on Metals and Alloys, by D. S. Billington .. 6
Powder Metallurgy, by J. E. Drapeau, Jr. 7
Damage to Properties by Quenching and Irradiation, by R. Maddin 9
Embrittlement of Metals, by B. R. Queneau 10
Materials for Aircraft Structures, by W. H. Dukes 11
Elemental Boron, by C. Talley 13
Furnace Atmospheres, by P. R. Burns 15
Progress in Machining, by R. L. Witsche 16
Materials for High-Temperature Bearing Applications, by R. E. Lee, Jr. 18
Hydrogen in Heavy Forgings, by J. E. Steiner 20
Physiological Effects of Radiation, by J. J. Nickson 22
Developments in Furnace Design, by F. O. Hess 24

Departments

Important Meetings 8
Obituaries 9
Men of Metal 11
Compliments 14
Meet Your Chairman 19
Metallurgical News 25
Employment Service Bureau 57

ASM Review of Metal Literature

A — GENERAL METALLURGY 27
B — ORE AND RAW MATERIAL PREPARATION 28
C — EXTRACTION AND REFINING 28
D — IRON AND STEELMAKING 29
E — FOUNDRY 30
F — PRIMARY MECHANICAL WORKING 35
G — SECONDARY MECHANICAL WORKING (FORMING AND MACHINING) 36
H — POWDER METALLURGY 38
J — HEAT TREATMENT 38
K — ASSEMBLING AND JOINING 39
L — CLEANING, COATING AND FINISHING 41
M — METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES 44
N — TRANSFORMATIONS AND RESULTING STRUCTURES 45
P — PHYSICAL PROPERTIES 47
Q — MECHANICAL PROPERTIES AND TESTS 48
R — CORROSION 51
S — INSPECTION AND CONTROL 53
T — METAL PRODUCTS AND PARTS 54
W — PLANT EQUIPMENT 55

Clyde Williams Leaves Battelle To Organize Company

CLYDE WILLIAMS, formerly president of Battelle Memorial Institute and a long-time member and friend of A.S.M., recently announced the formation of a new company to assist boards of directors and top management industries with broad technical and business problems. The new firm, Clyde Williams and Co., 50 West Gay St., Columbus 15, Ohio, will provide services in research programing and administration, in the application of science and technology to industry, and in problems of business organization and operation.

Dr. Williams expects his organization to direct a great deal of effort to the growth and expansion of existing companies by helping them to broaden their interests and to expand their fields of activity. Another important phase of the work will be concerned with the formation of wholly new companies. These activities will include the finding of new products to develop, company acquisitions and mergers, and the utilization of new technologies.

Long active in A.S.M. affairs, in the many years he was with Battelle Dr. Williams directed and improved upon the continuous supply of literature annotations which so many years originated from the Institute's vast store of original literature for use in the Review of Metal Literature published in *Metals Review*.

Dr. Williams was born in Salt Lake City, Utah, and received his education at the University of Utah, graduating with a B.S. degree in chemical engineering. He has since been given honorary degrees by that university and by Case Institute of Technology, Michigan College of Mining and Technology, Ohio State University and Marietta College. His early professional experience was gained in mining and smelting plants in the West and in 1924 he was a metallurgist for the government of Argentina on a commission to study the iron, steel and fuel resources of that country. He joined the original Battelle staff in 1929 as assistant to the first director and in 1934 he became director. From 1953 to 1958 Dr. Williams was president of the Institute, leaving to give full attention to the firm which he organized and heads.

Dr. Williams has served as director, trustee and committee member of numerous organizations, including the U. S. Chamber of Commerce, the National Association of Manufacturers, the Atomic Energy Commission, past president A.I.M.E., the Hoover Commission, Rand Corp., Howe Sound Co. and Battelle. During World War II he served on various civilian committees advising the War Production Board and other federal agencies on materials policies. He is the author or co-author of over 100 journal contributions and bulletins on a variety of subjects.

Describes Sendzimir Mill at Worcester

Speaker: James F. Fox
Waterbury Farrel Foundry & Machine Co.

The **Worcester Chapter** had the privilege of making the presentation of the first diploma of the Metals Engineering Institute during a recent meeting. Anton Brasunas, director of the Institute, presented the award to Ray W. Gilbert of Northboro, Mass., a metallurgist at Wyman-Gordon Co.

James F. Fox, sales manager, Rolling Mill Division, Waterbury Farrel Foundry & Machine Co., spoke on "The Sendzimir Mill, a New Rolling Process". He covered the development of this mill from its origin in Poland in 1934 through its introduction into the U. S. at the end of the war, to the present. Since the installation of the first mill in the United States, great strides have been made and 75 mills are now in operation here. Mr. Fox noted that the mill was forced into the specialty field in this country while in Europe it is used for rolling conventional steels as well.

The speaker outlined many of the mill's advantages and pointed out that, in many instances, the intermediate anneals required on the four-high type mill can be eliminated, since the equipment is adaptable to very high pressures because of its unique design features. It is possible to maintain close tolerances and roll thin-gage material in wide sections. Another advantage is the ability of the mill to roll out errors and imperfections which occur in previous operations. However, Mr. Fox noted that the best finish quality is produced when material of good quality is received for processing. The materials rolled by the Sendzimir mill may vary greatly and the change-over from one type to another can be made quickly. This results in high productivity and good service to customers when either small or large lots are involved.

Some of the materials capable of being rolled on this equipment include carbon steels, brasses, aluminum, stainless steel, silicon electrical steels and titanium and its alloys. Other special types processed are tantalum, molybdenum and uranium. Pure titanium is relatively easy but its alloys have proven difficult and offer special problems. While extremely light-gage material is relatively easy to roll on the Sendzimir mill, it does present certain difficulties in handling and must be treated quite delicately. Strip shape must be carefully controlled and the mill electrical controls kept in good adjustment. The equipment itself must be built to high precision standards and proper rolling techniques must be carried out.

In Sendzimir mill operation, high-quality surface finishes can be readily produced. This is dependent on the condition of the work rolls regardless of the type of mill. On the Sendzimir mill, the work rolls, nested into position and not mounted in work roll chocks, are readily accessible and can be changed in a matter of seconds. Thus, surface qualities need not be compromised and, in many cases, highly finished rolls are inserted in the mill for the final pass. The rolls can be of high carbon-high chromium toolsteel, high-speed steels or sintered tungsten carbide. The carbide rolls can be used to advantage in rolling and, although initial cost is considerably higher than steel rolls, unit costs per ton in view of the higher surface qualities obtainable are relatively less.

Design features of the Sendzimir mill were also described. Because of new developments in the mill, adjustments can be made to mill shape while rolling. The backing bearings can be individually adjusted to change the contour of the mill generally or the intermediate rolls can be laterally adjusted for altering strip edge characteristics. This makes it possible to cope with a wide range of strip shapes and a variety of widths without the laborious and time-consuming work of changing mill backing rolls as is necessary on other type mills.

Applications are under study for 120 and 144 in. width mills, which are to be used for rolling wide stainless steels and other alloys and metals for special purpose applications. Such wide strip is especially advantageous in applications requiring high-strength sheet sections with a minimum of welds.—**Reported by Paul J. Lisk for Worcester.**

M.E.I. Chalks Up First Year's Success

Coming Almost a Year From the Date the Metals Engineering Institute Inaugurated Its First Course, the Graduation Exercises of Some 72 Students in the Course Conducted by the Los Angeles Chapter Were Held With Appropriate Ceremonies. Speakers at the exercises included, from left: E. T. Bergquist, educational chairman; Charles H. Dickson, instructor; John E. Wilson, chairman; Anton de S. Brasunas, director, M.E.I.; and Donald S. Clark, immediate past president A.S.M.

During its first formal year of operation, the Metals Engineering Institute, a division of the American Society for Metals, attracted 611 home study, in-plant, and A.S.M. chapter students.

While the Institute has been in the planning stage for nearly four years, operations were only started in 1957 and last month marked the close of this first year. As a matter of fact, advertising was first released in September 1957, and the bulk of the students—more than 500—have been enrolled since that time.

Some 128 M.E.I. students have already graduated and have received the attractive and colorful certificate to mark their completion of one of the 12 courses now available.

Thirty-seven of the 48 states are represented in the M.E.I. enrollment, along with students from the District of Columbia, Canada, Mexico, Venezuela, Colombia, Denmark, Spain, Germany and Iran. Positions held by students range from company presidents to technical and research personnel, sales and administration executives and newcomers to the metal industry.

This truly international student body with its wide background in industry has had nothing but praise for the courses provided by the American Society for Metals through M.E.I. A letter from the first student, Glen C. Boyce, of Iowa Malleable Iron Co., typifies the enthusiasm for M.E.I.

In indicating that he will enroll in a second M.E.I. course, Mr. Boyce writes, "I have thoroughly enjoyed Elements of Metallurgy. The course has been very beneficial to me in the malleable iron industry. I want to express my sincere appreciation for your cooperation and the cooperation of each of the instructors with whom I have had contact in the study and completion of this first course".

Commenting on the first anniversary of M.E.I., W. H. Eisenman, secretary of A.S.M., said, "The response to this first year of operation has been encouraging indeed to the Society and to the staff of the new division. It is interesting to note that up to the end of 1957, only four courses were available and that these alone accounted for 95% of the enrollees. Only since January 1, 1958, have the additional eight courses been available.

"With 12 courses ready now", continued Mr. Eisenman, "and with six more scheduled for June 1, I look forward to an even greater rate of student enrollment in the Metals Engineering Institute".

The first four courses to be offered were—

Elements of Metallurgy
Heat Treatment of Steel
High-Temperature Metals
Titanium

On January 1, these additional eight courses were ready—

Steel Plant Processes
Metals for Nuclear Power
Stainless Steels
Electroplating and Metal Finishing
Primary and Secondary Recovery of Lead and Zinc
Steel Foundry Practice
Gray Iron Foundry Practice
Oxy-Acetylene Process

On June 1, the following six courses are to become available—

Blast Furnace Operations
Fundamentals of Ferrous Metallurgy
Toolsteels
Magnesium
Copper, Brass and Bronze
Arc Welding

Information on all of these courses is available from Metals Engineering Institute, a division of the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio, or a convenient coupon on p. 62 may be used.

Marks Anniversary

Lee Wilson, in announcing a revolutionary opened coil annealing method last month, marked the 25th anniversary of the Lee Wilson Engineering Co., Inc. Chairman of the board of his firm, one of the foremost designers and builders of coil annealing equipment, Mr. Wilson entered the business a quarter century ago with a new idea for annealing steel by the radiant tube method. In these years he has watched his idea grow until today his company builds more annealing furnaces than any other concern. The

Lee Wilson

Wilson company has pioneered many of the innovations in common use today. Among them are the bell-type furnace, the "O" shaped radiant tube, the high convection method of circulating hot gases and the portable base that eliminates expensive substructures. Wilson furnaces are used by all recognized steel producers in the United States and in leading steelmaking centers the world over. The company recently co-sponsored, together with Case Institute of Technology, the first International Symposium on Annealing of Low Carbon Steel, a highly successful venture that attracted the world's foremost annealing experts to Cleveland.

Philadelphia Honors Secretary Eisenman

Philadelphia Chairman Jerry Whitney Is Shown Presenting the Silver Bowl of Appreciation to National Secretary William H. Eisenman

Present at the "Bill Eisenman Night" Meeting Held by the Philadelphia Chapter Were, From Left: Jerry Whitney, Chairman; Mr. Eisenman; F. Foley, Past President; Art Collins, First Secretary of the Philadelphia Chapter; and Adolph O. Schaefer, Past President A. S. M.

The **Philadelphia Chapter** scored another "first" with the meeting in honor of National Secretary William H. Eisenman held recently. A large crowd was on hand to greet the popular secretary of A.S.M.

A. O. Schaefer, past national president (1956) related some of his personal experiences with Bill and reviewed the history of the Society under his leadership. He recalled how in the early years the Society was in such shaky financial condition that Bill collected dues from the Philadelphia Chapter to pay his hotel expenses. He then traced the growth of A.S.M. from a single unit of 200 members to a well-recognized organization of 101 chapters and over 29,000 members. Frank Foley, past president (1948) from the Philadelphia Chapter, also filled in with a few remarks on his association with Mr. Eisenman.

Mr. Eisenman in turn related some of his experiences with both Mr. Schaefer and Mr. Foley. He followed with a detailed explanation of the A.S.M. of Tomorrow, illustrating the talk with slides of architectural drawings and comments on the personal problems of getting the program started. He gave the audience a thumb nail sketch of the architect and explained why he thought the right man had been chosen for the job. Plans for the Metals University were also discussed.

Jerry Whitney, Philadelphia chairman, briefly commented on Bill Eisenman's leadership and then completely surprised him by presenting him with a beautiful silver bowl. The inscription on the bowl, said Mr. Whitney, puts into words the warm feeling each member of the Philadelphia Chapter has for Bill Eisenman. It reads:

"Presented to William Hunt Eisenman by the Philadelphia Chapter in recognition of his resourceful and dynamic leadership as national secretary since 1918, thus assuring the success of A.S.M.—the Engineering Society of the Metals Industry. Presented on the occasion of 'Bill Eisenman Night', November 1957".

The Philadelphia Chapter has started the bandwagon rolling to honor our executive secretary who has done so much to further the cause of A.S.M.—**Reported by N. J. Petrella for Philadelphia.**

Effects of Radiation on Metals and Alloys Given

Speaker: D. S. Billington

Oak Ridge National Laboratories

D. S. Billington, director, solid state division, Oak Ridge National Laboratory, spoke on "Effects of Nuclear Reactor Radiation on Metals and Alloys" at **Rocky Mountain.**

In the construction of reactors for power, the problems are essentially those of materials and specifically are metallurgical in nature. One must not design a pressure vessel or other reactor component on strength characteristics alone since radiation fields can radically alter the properties of a metal. Neutron capture cross section, secondary radiation effects, etc., are also important considerations.

A nuclear reaction becomes self-sustaining and controlled by the use of moderators to slow down fast neutrons which are mainly responsible for a nuclear chain reaction. The emission of fission fragments, neutrons and gamma rays creates metals problems not encountered in other environments. For example, a neutron collision within a metal molecule can create vacancies by atom displacement which can change the atomic structure of the metal. In fact, for every incoming neutron one gets approximately 2000 displaced atoms. Other possible effects of neutron bombardment are the creation of impurity atoms, interstitial atoms and ionization. Generally these are the basic theories regarding neutron collision with metal atoms. However, there are arguments supporting the existence of thermal spikes created by the incomplete conversion of energy into collision "knock-ons". The unconverted energy raises the temperature of the affected material and, in fact, if an average of 10^4 atoms is affected, a temperature rise of 1000° C. for 10^{-10} sec. will occur. The above theories are of high interest because of the dependency of diffusion and plastic deformation on the presence of vacancies or dislocations. The presence of dislocations created by nuclear bombardment can materially affect the deformation and behavior of subjected metals.

The resistivity of metals generally increases with increased exposure to 10^{17} nvt. maximum flux, but this increase is only about one-fifth the rate theoretically possible. Increased temperature under exposure tends to decrease the resistivity. The addition of beryllium and gold to copper greatly reduces the rate of resistivity decay with exposure.

Low-temperature radiation showed the inability of vacancies and interstitials to recombine. Radiation was found to have little effect on disordered structures but renders an ordered lattice disordered. Precipitation from solid solution occurs upon radiation at elevated temperatures but at liquid hydrogen temperatures precipitates and defects are "stored". Generally the hardness of a metal increases with radiation exposure as do the tensile and yield strengths; the uniform elongation is markedly decreased. Impact strength is adversely affected and grain size control has little effect on impact stability.—**Reported by Richard Agricola for Rocky Mountain Chapter.**

J. E. Drapeau, Jr., Glidden Co., Described "How Standard of Living Can Be Raised Through Powder Metallurgy" at a Meeting in Rockford. Shown are, from left: J. E. Smith; Q. C. Bowen, vice-chairman; Mr. Drapeau; D. A. Campbell, chairman; and J. F. Sisti and K. E. Hein, educational committee

Powder Metallurgy Is Rockford Topic

Speaker: J. E. Drapeau, Jr.
Glidden Co.

J. E. Drapeau, technical director, Chemical Pigments and Metals Division, Hammond, Ind., plant of the Glidden Co., gave a talk entitled "Standard of Living Raised Through Powder Metallurgy" at a meeting of the **Rockford Chapter.**

The conception of powder metallurgy dates back at least 3000-4000 years. When King Tut's tomb in Egypt was opened in 1922, metallic weapons made from powdered iron were found. Scientists knew that King Tut was buried over 3000 years ago and wondered how, since there were no furnaces, these metallic weapons could have been fabricated. According to a statement made by C. Stanley Smith at Massachusetts Institute of Technology in 1941, it might have been possible for sponge iron to be produced by nature on the side of a hill, with the aid of a freak fire from lightning, so that the iron oxide in contact with charcoal from wood was reduced to a metallic iron without melting.

The development of carbide cutting tools, in which tungsten carbide is one of the primary constituents, has been made through powder metallurgy. These cutting tools were developed in Germany at the turn of the century and in 1907 or 1908 were introduced to this country by General Electric Co. It has been reported that World War II might have been lost but for the fact that the rapid improvement in machining of alloy steels enabled industry to turn out the essential weapons and tools.

Many automotive parts are now being fabricated by powder metallurgy methods. The motor generator has brushes made of carbon containing a small quantity of copper powder, and, in some cases, lead powder. It is through powder metallurgy techniques that it is possible to have the storage battery in a car charged by the motor generator set using carbon brushes made by powder metallurgy. Even the front and rear lights use tungsten filaments fabricated by these techniques.

Mr. Drapeau pointed out the important part powder metallurgy has played in making parts for the telephone, radio and television industries, and lead powder lubricants for the construction and plumbing industries. Improvements in powder metallurgy techniques will also improve parts for farm equipment and household appliances.

The demands for energy today are increasing and as the demand increases, there will be a day when all stored-up energy, such as coal and oil, will disappear, and we will have to depend upon direct harnessing of solar heat and atomic energy to keep up our standard of living. Powder metallurgy will also have a part to play in supplying solid energy fuels for interplanetary space travel.—**Reported by G. W. Sandstrom for Rockford Chapter.**

Young Is Guest of Jackson

Eighty-five members of the **Jackson Chapter** were on hand to hear National President G. M. Young, technical director, Aluminum Co. of Canada, Ltd., speak on the "Uses of Aluminum Alloys in Heavy Industry", at a recent meeting.

Mr. Young first presented an up-to-the-minute review of A.S.M. activities, covering the increase in membership, the recently held 2nd World Metallurgical Congress, and a description of the headquarters building which was started early this Spring. He also covered the work being done at Western Reserve University where coded abstracts of over 2400 magazines are being made for future reference at the A.S.M.'s library. He reviewed the scholarships made available by the Society and the accomplishments to date of the Metals Engineering Institute. — **Reported by W. F. Stewart for Jackson.**

Panel Discusses Magnetic Inspection

A Talk on "Magnetic and Eddy Current Tools for the Inspection of Metals" by J. C. DeMaio, Field Engineer, Magnetic Analysis Corp., Was Followed by a Panel Discussion at a Recent Meeting Held by the New Haven Chapter. Panel members were, from left: Delmar Trout, Scovill Manufacturing Co.; John D. Berwick, technical chairman; Mr. DeMaio; Harold Schoff, American Brass Co.; and Kenneth B. Bissell, Bridgeport Brass Co.

Machinability Discussed at Texas

Shown at a Meeting in Texas Are, From Left: Curtis L. Horn, Chairman; E. J. Krabacher, Cincinnati Milling Machine Co., Who Discussed the "Metallurgical Aspects of Machinability"; and Joe Marx, Vice-Chairman

Speaker: E. J. Krabacher
Cincinnati Milling Machine Co.

E. J. Krabacher, senior research supervisor in charge of applied research on metal cutting, grinding and forming, Cincinnati Milling Machine Co., discussed the "Metallurgical Aspects of Machinability" at **Texas.**

The measures of machinability are tool life, power required and finish. The productivity and economy in a given method of machining are the final judges of its feasibility.

Mr. Krabacher explained the three types of chips produced in metal cutting: Type 1—Segmental chips produced when cutting cast iron or nonferrous metals. Type 2—Continuous chips without built-up edge which result from plastic deformation ahead of the tool as it is forced through a ductile metal. This can be done at high speeds with proper tool design and with proper cutting fluids. Type 3—Continuous chip with a built-up edge. This type of chip intermittently welds to the tool and produces a ragged appearance.

Mr. Krabacher illustrated what takes place in the process of cutting. The work required for cutting is spent in three ways: (1) The majority of the work is converted into heat in the chip; (2) additional energy causes residual stresses in the chip and the workpiece; (3) about one-third of the energy is spent in friction of the chip rubbing against the tool.

Tool life and chip-forming efficiency go together and a reduction in the tool-chip interface temperature increases tool life dramatically. The way to reduce temperature is to reduce the friction and increase the shear angle. An effective cutting fluid can reduce friction.

The built-up edge of Type 3 chip causes rapid tool wear. The pieces which are built up and sloughed are very abrasive and increase wear rate.

Metals having the same hardness but varying microstructures and microconstituents can cause significant variations in tool wear. Steels of different analyses but with similar microstructure and microconstituents generally have the same tool life.

Hot machining and electro-discharge machining offer possibilities in machining the high-strength steels being developed for the newer aircraft and missiles. At strengths of 250,000 psi. and higher, the workpiece approaches the hardness and strength of the cutting tool. Tool strength and rigidity are serious problems.

One possible solution is to reduce the shear strength of the material by hot machining using induction heat, but the chip-tool interface temperature is increased. Development work has shown, however, that heating effects do not necessarily have to penetrate beneath the chip. The intention of heating is to decrease the bulk strength of the chip.

In electro-discharge machining an electrode of brass or of other conductive material is arced to the workpiece at high frequency, producing a cutting action. The material when first removed is molten and then solidifies into droplets which vary in size up to 0.001 in. diameter. Work is immersed in a hydrocarbon fluid which flushes the particles out of the gap. A brass wheel can be used as an electrode. This type of machining requires no force between tool and work so that rigidity is not a problem. One of the limitations of electro-discharge machining is the low metal removal rate. Research is under way to increase this rate.

Mr. Krabacher showed movies of electro-discharge machining taken at rates of 3000 and 7000 frames per sec. which clearly illustrated the action of metal removal.

While these two new methods of machining are still experimental they have great promises for general industry as well as aircraft and missile industries—**Reported by M. C. Lucky for Texas.**

Baltimore Tours Martin Co.

Mar. 17, besides being St. Patrick's Day, was also a red-letter day in the history of the Martin Co. due to the fact that the Navy successfully launched a satellite via the Martin Vanguard. Members of the **Baltimore Chapter** were invited by the Martin Co. to share in the celebration of this event by touring the plant near Baltimore. Some 75 members were in attendance, consisting of 18 Martin employees who served as guides and 57 visitors.

Areas of special interest visited by the various groups were: Marforming, heat treat, spot welding, honeycomb bonding, parts fabrication (both plane and missile), assembly of the Sea Master and assembly of the Martin Marlin.—**Reported by H. E. Miller for Baltimore.**

IMPORTANT MEETINGS
for June

June 8-13—Society of Automotive Engineers. Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. (John A. C. Warner, Secretary, 485 Lexington Ave., New York 17).

June 9-10—Malleable Founders' Society. Annual Meeting, Homestead, Hot Springs, Va. (Lowell D. Ryan, Executive Vice-President, 1800 Union Commerce Bldg., Cleveland 14).

June 9-12—Microscopy Symposium. Fifth Annual Session, Del Prado Hotel, Chicago. (W. C. McCrone, Jr., 500 E. 33rd St., Chicago 16).

June 9-12—National Materials Handling Exposition and Conference. Public Auditorium, Cleveland, Ohio. (Clapp & Poliak Inc., 341 Madison Ave., New York 17).

June 9-13—International Automation Congress and Exposition, Coliseum, New York. (Richard Rimbach Associates Inc., 845 Ridge Ave., Pittsburgh 12).

June 15-19 — American Society of Mechanical Engineers. Semi-Annual Meeting, Statler Hotel, Detroit. (C. E. Davies, Secretary, 29 W. 39th St., New York 18).

June 21-24—Alloy Casting Institute. Annual Meeting, Homestead, Hot Springs, Va. (E. A. Schoefer, Executive Vice-President, 286 Old Country Rd., Mineola, N. Y.).

June 22-27 — American Society for Testing Materials. Annual Meeting and Exhibit, Statler Hotel, Boston. (Robert J. Painter, Executive Secretary, 1916 Race St., Philadelphia 3).

Recent Plane Disasters Claim A.S.M. Members

LESTER E. WILENSKY, 37, development engineer for Dow Chemical Co.'s magnesium technical service and development group, was one of the 47 who perished when a Capital Airlines Viscount crashed during a landing approach at Tri-City Airport, Mich. Mr. Wilensky was a graduate of Rensselaer Polytechnic Institute and had been with Dow since 1953. He was a member of Saginaw Valley Chapter.

ROBERT KALLENBAUGH, past chairman of the Los Angeles Chapter (1954-55) was killed in the United Airlines crash on Apr. 21 near Las Vegas, Nev. His family requests that memorial gifts should be sent to: Medical Research Fund, Children's Hospital, Westwood, Calif. Mr. Kallenbaugh was district manager for the Steel Tube Division, Timken Roller Bearing Co.

Obituaries

ROBERT L. SWEET, past chairman of the West Michigan Chapter (1955-56), died of a heart attack on Mar. 17. Dr. Sweet, besides being very active in Chapter affairs, served as faculty advisor to the Michigan State University student chapter. At the time of his death he was professor of metallurgical engineering at Michigan State.

K. W. REED, consulting mechanical engineer in Cleveland since 1930, died on Mar. 31. Mr. Reed headed his own consulting business, specializing in machine design and development, as well as production management. A graduate of Massachusetts Institute of Technology in 1913, Mr. Reed worked for Warner & Swasey Co. and American Laundry Machinery Co. before becoming a consultant.

C. M. CARMICHAEL, who at the time of his retirement in 1952 was vice-president in charge of stainless steel and alloys and a director of Shawinigan Chemicals Ltd., Montreal, and a director of Canadian Stebbins Engineering and Manufacturing Co. Ltd., Montreal, died late last November. After retirement he remained for a time as consultant and director of Shawinigan Chemicals.

Mr. Carmichael was born in Alabama in 1888 and educated at public and private schools in Alabama, and Southern University and the University of Alabama. He served from 1910 to 1915 in the Engineering Corps in charge of the laboratory for testing materials for fortifications, etc., and finally in charge of construction on Tombigbee River. His experience in electric furnace work dated back to 1915-17, when he joined Anniston Steel Co., which made "synthetic pig iron" from scrap. He went to Canada in 1917 to start the steel plant of the Imperial Munitions Board in Toronto, and joined Electro Metals Ltd., in Welland, Ont., in 1918 as assistant manager. In 1923 he organized Welland Steel Castings Ltd. for the manufacture of high-grade steel castings. In 1930 he disposed of his interests and joined Shawinigan Chemicals as manager, stainless steel and alloys division. He was made vice-president of that division and a director of the company in 1945. He produced the first stainless steel made in Canada and was considered an authority on acid and corrosion resisting steels.

Mr. Carmichael, chairman of the Montreal Chapter in 1935-36, is survived by his wife and one son.

WILLIAM F. POWELL, superintendent of the electric melting department at Crucible Steel Co. of America's Sanderson-Halcomb Works, Syracuse, N. Y., died unexpectedly in February. Mr. Powell has been active in electric steelmaking for almost 41 years. He joined Crucible in 1917 and after serving in other capacities was appointed assistant superintendent of the electric melting department in 1945 and superintendent in 1947.

Properties Damage Topic at New York

From Left: Robert Maddin, University of Pennsylvania, Who Spoke on "Damage Due to Properties by Quenching and Irradiation" at a Meeting of the New York Chapter, and Herbert Pflaster, Who Gave the Coffee Talk on "Taxes", Confer With Maxwell Gensamer, the Technical Chairman

Speaker: R. Maddin

University of Pennsylvania

Robert Maddin, director of the School of Metallurgical Engineering, University of Pennsylvania, spoke on "Damage Due to Mechanical and Physical Properties by Quenching and Irradiation" at a meeting of **New York Chapter.**

Observers have often confused the damage to mechanical and physical properties produced by quenching and irradiation. They have certain superficial similarities. However, research on copper and other metals has led to conclusions of far-reaching effects. Dr. Maddin illustrated his talk with slides and on the blackboard.

Dr. Maddin used comparison of the known effects of metal quenching with the observed effects of irradiation to verify theories in changes of atomic structure in metals subject to experiment. The more familiar similarities are increases in hardness and yield strength.

Radiation damage in metals is the result of high energy particles—neutrons, electrons and gamma rays. Neutron bombardment illustrates the point. Such bombardment can result when a neutron strikes an atom. The nucleus absorbs the neutron and either changes the characteristics of the atom or displaces it. Displacement by fast neutrons is called "primary knockout". At high energy, "secondary knockouts" will often follow. Dispersion of the neutron's energy is called the "cascade" effect.

Not all the observations are yet explained. Grain growth results from irradiation, especially in uranium, creep rate changes, hardness increases, as does embrittlement, the yield strength rises, the stress-strain curve flattens and the transition temperature may change.

Annealing of irradiated metals, often difficult, will restore them, at least partially, to their original state.

Repeated quenchings (75 to 100 times) show elongation in copper samples indicating that quenching stresses exist.

This meeting, designated as Students Night, was observed by the attendance of a number of graduate and undergraduate students from local institutions. The Chapter Scholarship, an annual award, was given to Howard Ocken.—**Reported by L. W. Collins, Jr., for New York Chapter.**

Receives Lehigh's Stoughton Award

Thomas G. Foulkes (Left), Metallurgical Engineer, Bethlehem Steel Co., Is Shown Receiving the Lehigh Valley Chapter's Bradley Stoughton Award From Dr. Stoughton, Professor Emeritus, Lehigh University and Past National President A.S.M. Second from right is Bernard R. Queneau, Tennessee Coal and Iron Division, U. S. Steel Corp., who spoke on "Embrittlement of Metals". On right is Leon J. McGeady, Lafayette College, chapter chairman

Speaker: B. R. Queneau

U. S. Steel Corp.

At the Stoughton Award Night Meeting of the **Lehigh Valley Chapter,** Bernard R. Queneau, assistant manager of the department of metallurgy, Tennessee Coal and Iron Division, U. S. Steel Corp., presented a talk on "Embrittlement of Metals".

Brittle behavior of metals received national attention during World War II when 11 ships split in half. In fact, approximately 20% of the 5000-odd ships built during the war experienced some type of brittle failure.

Embrittlement of metals is affected by the physical and chemical nature of the material, methods of fabrication and the operating stresses and temperature.

Graphs were used to show the relationship between tensile properties and subzero temperatures for the face-centered and body-centered cubic lattices. With any rate of loading, materials with face-centered cubic lattice increased in tensile and yield strengths, elongation and impact strength from 0 to −300° F., whereas those materials with the body-centered cubic lattice exhibited a marked decrease in these tensile properties in this temperature range. Other curves showed the transformation range from brittle to ductile failures for various steels with relationship to temperature.

Dr. Queneau pointed out that metals are not brittle but rather that shapes are brittle. Stress raisers due to design must be given consideration with regard to operating stresses, environment and temperature. Notches, residual stresses, high-temperature transformation products and improper weld technique also have a definite effect in promoting brittle fracture.—**Reported by R. C. Moorhead for Lehigh Valley.**

Recipient this year of the Bradley Stoughton Award presented annually to a member of the Lehigh Valley Chapter for outstanding contributions to metallurgy was Thomas G. Foulkes, metallurgical engineer, Bethlehem Steel Co.

Mr. Foulkes graduated from Miami University with a B.S. degree in English and from the Colorado School of Mines with an engineer of mines degree in metallurgy and a Ph.D. degree in metallurgy in 1923. Following graduation he entered the Bethlehem Steel Co.'s loop course and after a number of varied assignments became assistant chief metallurgist in 1945. Last year he was promoted to the vice-president's staff as metallurgical engineer.

Mr. Foulkes has had a paper on "Openhearth Melting Practice" published in *Metal Progress* (1936). In recent years he has made significant contributions to the manufacture of heavy forgings, particularly turbine rotors and generator shafts. He is a member of the Metallurgical and Research Committee of the Forging Manufacturer's Association and a member of A.S.T.M.'s Sub-Committee VI of A-1, studying the effect of hydrogen on heavy forgings. He is currently chairman of the Brittle Fracture Committee organized by A.S.T.M. to study factors contributing to the brittle fracture of steels.

Atomic Power Problems Discussed at Wilmington

Speaker: J. H. Frye, Jr.

Oak Ridge National Laboratory

At a meeting of the **Wilmington Chapter,** J. H. Frye, Jr., director, metallurgy Division, Oak Ridge National Laboratory, gave an illustrated lecture on the principal problems that stand in the way of making atomic energy economically feasible and competitive with other energy sources. He noted that our fossil fuel resources are finite and that the turn to nuclear power is probably one of eventual necessity. The source of fuel comes from fission energy, however, perhaps our most profitable source of energy will ultimately come from fusion-type energy.

J. H. Frye, Jr.

At present, this country is still developing fission-type reactors. However, there is in existance a useful, low-efficiency reactor that develops steam. This reactor would not be economical for commercial or public power purposes owing to its low efficiency but, in remote areas, it is useful because of its low consumption of fuel.

Dr. Frye discussed in detail the problems encountered in reactors using liquid metals. He reviewed the difficulties encountered in achieving satisfactory resistance to corrosion by liquid metals without seriously lowering reactor efficiency. As yet, research has not led to a good compromise between these seemingly opposing goals.—**Reported by Liston Noble, Jr., for Wilmington.**

Hartford Completes Course

The Hartford Chapter has recently completed an educational program of metallurgical seminars. The program was presented on four Wednesday evenings at the Hartford Graduate Center of R.P.I. and attracted an attendance of 100 persons.

The subjects and speakers for the course were: Use of X-Ray in Metallurgical Research, by B. L. Averbach, Massachusetts Institute of Technology; Perfect Crystals, by R. L. Eisner, Westinghouse Research Laboratories; Dislocation Theory, by Gunther Schoeck, Westinghouse Research Laboratories; and Theoretical Alloy Design, by W. Hibbard, General Electric Research Laboratories.

Surface Combustion Corp. has announced appointment of S. C. SURRAT as product engineer, standard equipment division, R. F. POMEROY as product engineer, ferrous heat treat equipment, W. A. PHILLIPS as product engineer, nonferrous equipment, and W. F. PARKER as assistant product engineer, all in Toledo, Ohio.

♦ ♦ ♦

Oakite Products, Inc., has announced that WALTER G. SITTMAN, Pittsburgh division manager, has been transferred to Rochester to head the upper New York State field division, JOHN P. MELHADO, New York City representative, will replace Mr. Sittman in Pittsburgh, and VICTOR L. BALTZELL, representative in Dallas for the past 15 years, will manage the new division in Louisville, Ky.

♦ ♦ ♦

MARCUS W. SAXMAN III has been named assistant district sales manager in the Cleveland branch of Latrobe Steel Co. Mr. Saxman has been assistant to the president of the company.

♦ ♦ ♦

WILLIAM C. WEST, formerly vice-president and secretary, has been elected president of West Instrument Corp., succeeding his brother who was lost in a recent airplane accident. WILLIAM A. KELLY, attorney and director, was elected secretary.

♦ ♦ ♦

ARTHUR L. KRASNOW is sales manager of the Eastern Region, Nuclear Systems Division of The Budd Co. He will be responsible for the sales of radiography machines and measuring devices utilizing radioactive materials.

♦ ♦ ♦

THOMAS M. HOGAN, who has been assistant district sales manager, is now district sales manager of the New Orleans district for Jones & Laughlin Steel Corp.

♦ ♦ ♦

MYLES T. MUSGRAVE, a chemist in production and design engineering in Army Ordnance for a number of years, has been named assistant to Harold J. Dawe, research director for Acheson Industries, Inc., Port Huron, Mich.

♦ ♦ ♦

BURTON SCHELLENBACH has been named vice-president, sales, for H. K. Porter Co., Inc., with headquarters in the Pittsburgh offices.

♦ ♦ ♦

MARTIN K. SCHNURR, JR., Detroit sales office, Jones & Laughlin Steel Corp., has been named assistant to the general manager of sales for the Stainless Steel Division in the Louisville, Ohio, plant.

♦ ♦ ♦

WILLIAM BUHL was recently appointed head of commercial sales for Chromalloy Corp., to be responsible for the sale of Chromallizing service and Chromalloy stainless sheet.

♦ ♦ ♦

JAMES H. MOORE, former general manager of NRC Equipment Corp., is now in charge of production and sales of all high-vacuum equipment manufactured at Newton, Mass.

Specifies Aircraft Material Needs

From Left: Wilfred H. Dukes, Bell Aircraft Corp., Who Spoke on "Materials for Future Aircraft Structures" at a Meeting of the Boston Chapter, Is Shown With James Martin, and William F. Collins, Technical Chairman

Speaker: W. H. Dukes

Bell Aircraft Corp.

Wilfred H. Dukes, chief, structural analysis section, Research Division, Bell Aircraft Corp., spoke on "Materials for Future Aircraft Structures" at a meeting of the **Boston Chapter.**

Mr. Dukes reviewed the principal airframe structural problems, including the reduction of material strength and the development of thermal gradients as a result of aerodynamic heating. The selection of materials for airframes operating at high temperature cannot be based on simple yield or ultimate strength since most of the airframe is designed by compression instability failures.

Methods have been developed at Bell to find the weight of the best possible structure for a particular temperature and loading condition considering various materials and various types of construction and selecting the optimum structural proportions in each case. Charts developed by these methods were shown to indicate areas where the various materials are most efficient. It was shown that forms of construction which rely on the stability of plates will require the low density materials such as magnesium and titanium, while skin stringer and sandwich constructions can effectively use higher strength steel and nickel-base alloys. No single material can be applied for a particular structural temperature. The data presented establishes that future development of all presently available materials is necessary, but higher strengths must be accompanied by the development of expanded forms of construction of which sandwich skins are an example.

As structural temperatures exceed 1400° F., which corresponds approximately to Mach 5, the weight involved by using high-temperature materials becomes prohibitive, with little promise of significant improvement. Attention is, therefore, being directed to protected forms of construction using an insulated aluminum structure, with water cooling if the flight time is sufficiently long. An important component of the insulating system is a very light outer shell consisting of small panels of temperature-resistant material which forms the external contour. In this way, primary load-carrying functions of the structure are handled by low-temperature aluminum, while the high-temperature outer shell supports only secondary loads. The requirement of high strength is, therefore, removed from the materials development problem. The principal requirements then become availability in very thin stock and a capability for resisting oxidation under conditions of high temperature and high-speed air flow. Such requirements should not be difficult to meet and would permit satellite velocities with manned vehicles. Such performance is already possible with the power plants available.—**Reported by J. B. Savits for Boston Chapter.**

National Officers Are Guests at Detroit

National President G. M. Young, Technical Director, Aluminum Co. of Canada, Presented a Talk on "Aluminum Alloy Development" at a Meeting Held Recently by the Detroit Chapter. He is shown, at right, with Joseph Gurski, technical chairman of the meeting

National Secretary W. H. Eisenman Is Shown Presenting an A.S.M. Student Scholarship Award to Edmund A. Merriman, University of Michigan, at the Same Meeting. A similar award was also presented to T. Gottleib of Wayne State University by Mr. Eisenman

Turns Over Chapter Charter

S. P. Rideout (Right), Is Shown Transferring the Savannah River Chapter Charter to Incoming Chairman, W. L. Worth, During Ceremonies Installing New Officers at a Dinner Meeting Held in Augusta, Ga.

President Gives Award

National President G. M. Young Is Shown as He Presented an A.S.M. Certificate to Luc Giroux, a Senior Metallurgy Student at Laval University During a Meeting Held Recently by the Quebec Chapter

Jersey Honors Secretary

Henry Scarbeck (Left), Secretary of the New Jersey Chapter, Is Shown Being Congratulated by Stan Lindstrom, Chairman, Upon Receiving an Award for His Years of Outstanding Work as Secretary of the Chapter. Mr. Scarbeck received the award during the National Metal Congress held in Chicago last November

Young Is Quebec Guest

G. M. Young, National President A.S.M., Who Presented a Talk on the "Extrusion Process" at a Meeting of Quebec Chapter, Is Shown Accepting a Gift From the Chapter From H. P. Tardif. Since Pres. Young has given this talk before many of the chapters during this season, it is not being reported here

Describe Cold Forming

John Heater (Left), Cincinnati Milling & Grinding Machines, Inc., and A. H. Peterson, Lockheed Aircraft Co., Were the Speakers at a Recent Meeting Held by the Los Angeles Chapter. They discussed "Cold Power Spinning" and "Explosive Forming"

Speakers: John Heater Larry Shiller and A. H. Petersen

At a panel-type meeting held by the **Los Angeles Chapter,** John Heater, western field engineer, Process Machinery Division, Cincinnati Milling & Grinding Machines, Inc., discussed techniques of "Cold Power Spinning"; Larry Shiller, engineer at Norris-Thermador Corp., discussed "Cold Forming" on development of cartridge cases and metal components for rocket engines for missile use; and A. H. Petersen, producibility methods group engineer, Lockheed Aircraft Co., presented a talk on "Explosive Forming".

Cold power spinning, a new metal forming art, is a rotary extrusion process which creates extreme cold plastic flow in ductile metals. Called by different names (Cincinnati uses Hydrospin), the techniques employed by various advocates of the process are all commonly based on fundamental principles for making conical, tubular or curvilinear surfaces of revolution.

Metal is extruded between forming rollers and a hardened rotating mandrel. Basically axial translation of metal elements circumvents force systems which might cause wrinkling or tearing failures in the blank. Unit pressures exceeding 400,000 psi. create single pass thickness reductions of 75%, or 90% in multiple passes, without annealing, in steels up to ¾ in. thick. Resulting grain structure is severely deformed and highly oriented, giving greatly increased strength at the expense of reduced ductility.

Most common metals have been worked easily, some from cast preforms. Alloys such as AISI 4340 and 52100 spin well. Recent work with 17-7PH and PH15-7MO stainless steels produced as-spun strengths over 200,000 psi. Parts in 6061-S aluminum, heat treated before spinning and age hardened afterwards, exhibited unusual accuracy, dimensional stability and high-bracket physical properties. — **Reported by Henry Van Ryn for Los Angeles.**

Richmond Hears Talk On Elemental Boron

Speaker: C. Talley

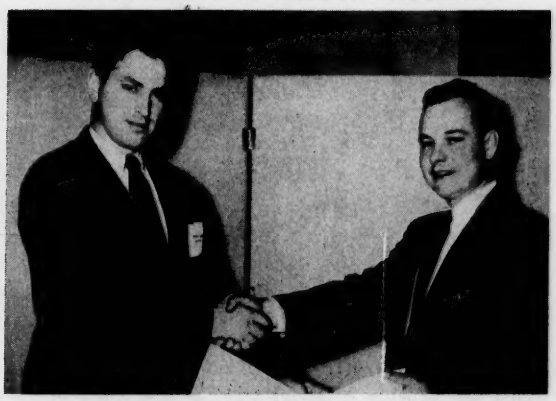
Experiment Inc.

"Elemental Boron" was the subject presented before the **Richmond Chapter** by Claude Talley, who described the work carried out at Experiment Inc. on the preparation, combustion, mechanical and physical properties of elemental boron.

Thermodynamically the combustion of boron in oxygen produces more heat per unit weight of fuel than many other solid fuels; however, in practice this advantage has been difficult to achieve because of inefficient burning. A kinetic study of the combustion of polycrystalline boron under controlled conditions showed that around 1000° C. burning in oxygen at 1 atm. was slow and was limited by the evaporation rate of boron oxide. At temperatures around 2000° C. burning was self-sustaining and fairly rapid. Under these conditions the collision rate of oxygen with the boron may have been a controlling factor, as well as evaporation of boron oxide, while evaporation of boron itself was not.

Polycrystalline boron of high purity (greater than 99%) having a faceted surface has been produced by the reduction of boron tribromide by hydrogen. A glassy variety has also been produced with a smooth surface. Tests indicated that samples of this form had a modulus of elasticity of approximately 64 x 10^6 lb/in.^{2} and a tensile strength between 230,000 and 350,000 lb/in.^{2}.— **Reported by W. W. Berkey for Richmond Chapter.**

Receives Geisler Award



Shown Receiving the Annual Geisler Award of the Eastern New York Chapter Is Garland W. Reese, Allegheny Ludlum Steel Corp., Who Presented a Talk on "Oxygen in Alloy Steel Melting". Presenting the award is vice-chairman J. Westbrook

Speaker: G. W. Reese, Jr.

Allegheny Ludlum Steel Corp.

Garland W. Reese, Jr., was presented with the Geisler Award at a recent meeting of the **Eastern New York Chapter.** The Geisler Award is given annually to an outstanding young metallurgist under the age of 35 for his contributions in the field of metallurgy in honor of Alfred E. Geisler.

Mr. Reese talked on the use of "Oxygen in Alloy Steel Melting". Oxygen enriched gases are used in openhearth, Bessemer and blast furnace operations. However, these processes did not fall into the category of the subject.

The properties of stainless steels are enhanced by the lowering of the carbon level. Many methods have been tried to drive down the carbon content, but they have been timely and costly. Iron ore and scale have been used and large melting losses, large slag volume, and furnace damage have resulted. An important thermodynamic consideration which enables the metallurgists to understand the decarburization process is the fact that, at any given temperature and chromium level, there is an equilibrium carbon concentration. The higher the temperature and the lower the chromium, the lower is the equilibrium carbon concentration. For a 1.0% Cr bath at 2900° F., a carbon level of 0.05% can be attained. With the use of oxygen, the bath temperatures have been steadily rising and also the chromium content for an equally low carbon level. The maximum temperatures at the present time are about 3350-3375° F. Oxygen is injected at the slag-metal interface and the bath is oxidized. After this oxidation process, a cooling mixture is added and lastly a reducing mixture. — **Reported by Louis Ianiello for Eastern New York.**

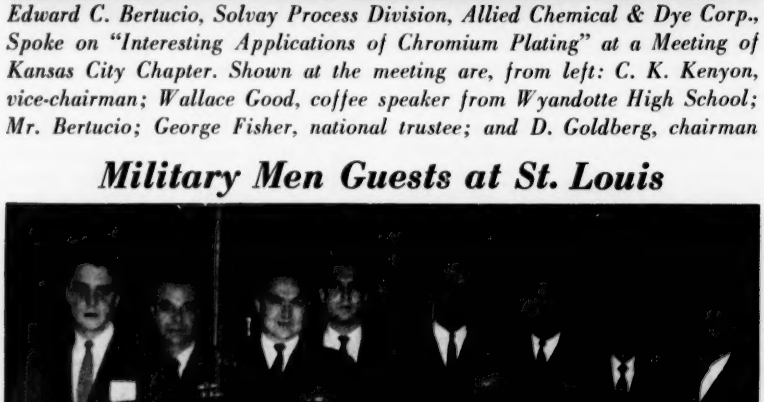
Outlines History of Metallurgy

F. N. Rhines, Professor of Metallurgy, Carnegie Institute of Technology, Spoke on "History of Metallurgy" at a Meeting of Savannah River Chapter. Shown, from left: M. H. Wahl, DuPont Co.; D. B. Metz, Sylvania-Corning Nuclear Corp.; G. W. Beckman, Program Chairman; Lee L. Davenport, Sylvania-Corning Nuclear Corp.; Dr. Rhines; and W. L. Worth, Chapter Chairman

Chromium Plating Kansas City Topic

Edward C. Bertucio, Solvay Process Division, Allied Chemical & Dye Corp., Spoke on "Interesting Applications of Chromium Plating" at a Meeting of Kansas City Chapter. Shown at the meeting are, from left: C. K. Kenyon, vice-chairman; Wallace Good, coffee speaker from Wyandotte High School; Mr. Bertucio; George Fisher, national trustee; and D. Goldberg, chairman

Military Men Guests at St. Louis



"Metallurgical Aspects of the Earth Satellite" Were Given by Alexander Simkovitch, U. S. Naval Research Laboratory, at a St. Louis Meeting. Present were, from left: Lt. Simkovitch; Lt. Col. Charles Baker, U.S.A.F.; Lt. Cdr. Clyde Killian, U.S.N.; C. D. Marks, McDonnell Aircraft Co.; Capt. Tom Collins, B.A.R.; Lt. Cdr. John Carl, B.A.R.; A. J. Love, St. Louis Ordinance District; and George Fisher, national trustee A.S.M.

Compliments

To EMIL PEROUT, a metallurgist for the past five years at Clevite Corp., who has been named head of the metallurgy department at Penn College.

♦ ♦ ♦

To CARL F. HOFFMAN, superintendent of blast furnace department, Sparrows Point Works, Bethlehem Steel Co., who has been chosen as the 1958 recipient of the David Ford McFarland Award by the Penn State Chapter.

♦ ♦ ♦

To WALTER R. HIBBARD, JR., manager, alloy studies research, General Electric Co., who has been elected president of the Metallurgical Society, A.I.M.E.; to JOHN CHIPMAN, professor of metallurgy, Massachusetts Institute of Technology, who has been elected vice-president; and to J. B. AUSTIN and K. L. FETTERS, who have been elected to the board of directors.

♦ ♦ ♦

To JEROME STRAUSS, on his retirement as vice-president, Vanadium Corp. of America, after 30 years of service. Mr. Strauss was the Burgess Memorial Lecturer of the Washington Chapter in 1955.

♦ ♦ ♦

To E. F. NIPPES, professor of metallurgical engineering and director of welding research, Rensselaer Polytechnic Institute, who was chosen by the American Welding Society to present the annual Adams Lecture at the 39th meeting held in St. Louis. Other A.W.S. honors were bestowed upon the following A.S.M. members: LEON C. BIBBER, chief research engineer, welding, U. S. Steel Corp., was made an honorary member; EDWARD C. MILLER, inspection engineer, Oak Ridge National Laboratory, was elected a director-at-large.

Saginaw Participates In Engineers' Week

The **Saginaw Valley Chapter** joined 15 other local engineering societies in the celebration of an Engineers' Week event. Donald H. Loughridge, director of nuclear power engineering, General Motors Research Staff, was the principal speaker at the dinner meeting.

Dr. Loughridge compared the technological advances made by Russia over the past several years with the advances we have made in this country. He pointed out that Americans must be willing to make sacrifices to get into and stay in the lead in this age of nuclear energy and space science. He also mentioned that we should stop thinking of the Russians as a "bunch of peasants" and recognize the scientific developments they have made since World War II.

Jacksonville Hears Talk On Furnace Atmospheres

Speaker: P. R. Burns
Lindberg Engineering Co.

Peter R. Burns, metallurgical service engineer, Lindberg Engineering Co., talked on "Protective Furnace Atmospheres" at **Jacksonville.**

Mr. Burns related how protective furnace atmospheres are employed to perform one or both of two important functions to insure better quality in metals that are heated in a furnace. These functions are prevention of oxidation and decarburization, commonly recognized as a loss of surface carbon in ferrous metals. A wide variety of gases and mixtures of gases are used for protective furnace atmospheres. Bottled hydrogen, nitrogen, argon and sulphur dioxide are available. Natural and propane gases are commonly employed for burning in atmosphere gas converters. The chemical composition of the gas product depends on the ratio of input air to gas.

A typical atmosphere gas converter consists of air and gas flowmeters, proportioning mixer, compressor, fire check, burner, combustion chamber and surface cooler, with condensate separator and a trap. The complexity of the combusted gas mixtures at various ratios, and the resulting effects with respect to oxidation of iron during heating and cooling were also explained.

Mr. Burns classified the method of preparing exothermic-base combustion of gas-air mixture. This may be followed by cold water, refrigeration or absorbent tower dehydration, depending on desired dew point; prepared nitrogen-base exothermic-base followed by removal of carbon dioxide and water vapor; endothermic-base gas-air mixture reacted in catalyst-filled externally heated chamber; and charcoal-base air passed through charcoal-filled vertical retort internally heated with prepared gas drawn off at maximum temperature zone. His talk covered heat treatment processes and furnace atmospheres recommended for low-carbon steel, stainless steel, high-speed toolsteel, copper-nickel alloy and brass.—**Reported by Anthony Breda for Jacksonville.**

A Use for Old Magazines

Albert Croissant, Professor of English at Occidental College, Los Angeles, and president of "Magazines for Friendship", suggests that an excellent use of discarded copies of *Metal Progress* would be to send them to a foreign university. Single copies, tightly rolled in strong paper about 10 in. wide, may be mailed at 12½c per lb.

Prof. Croissant also thinks that back issues of almost any American magazine would do better in the hands of people abroad than to be discarded.

Attend Radiographic Inspection Classes

The Golden Gate Chapter, Cooperating With the Santa Clara Valley Chapter and the Northern California Section of the Society for Nondestructive Testing, Recently Completed a Ten-Week Course on "Radiographic Inspection", Conducted by the X-Ray Department, General Electric Co. Shown is a group of students attending one of the meetings, which drew a total of 181 persons registered, with 114 persons successfully completing the course

Young Speaks at Peoria Meeting

G. M. Young, President A.S.M. and Technical Director, Aluminum Co. of Canada, Ltd., Spoke on "Light Alloys in Heavy Industry" at a Meeting of Peoria Chapter. Shown are, from left: Dale Wright, technical chairman; Mr. Young; and John Frantzreb, chairman. (Report by O. Philips)

Atlanta Members Tour Glass Factory

Members of the Atlanta Chapter Who Recently Toured the Owens-Illinois Glass Plant, the World's Most Modern Glass Container Factory, Included, From Left: H. S. Bandy, R. J. Greene, W. T. Paulk, R. B. Belser, Chairman, F. A. Teeple, R. E. Davis, J. T. Butler and P. J. Duffy. The meeting enjoyed one of the chapter's largest membership turnouts this season

Traces Progress in Machining

R. L. Witsche (Left), International Harvester Co., Who Talked on "Progress in Machining" at Montreal, Is Shown With Chapter Chairman K. Shaw

Speaker: R. L. Witsche

International Harvester Co.

At a meeting of **Montreal Chapter,** R. L. Witsche, assistant general supervisor, mechanical engineering research section, International Harvester Co., spoke on "Progress in Machining". Mr. Witsche traced machining developments during the 19th Century, the period when many of the machine tool manufacturers so well known today began their operations. During the latter part of the century in America, universal grinders, turret lathes and automatic gear motors made their appearance.

In the early 1900's progress in machine tool design accelerated. Improved lubricating oils, cutting oils, high-speed steel and greater accuracy made their contribution. Lathes, mills and drill and tap machines have now become the mainstay of modern mass production. Grinding is becoming probably the largest and fastest developing process in modern machining. It is especially significant that we are today able to grind materials which might otherwise be impractical or uneconomical to machine.

Chipless machining, although not a new process, has in recent years been reappraised and developed. This process, the cold displacement of metal until it takes the desired shape, has evolved from metal spinning to become the modern flow turning technique. The process, which can be applied to many metals, is faster than conventional machining and eliminates the loss of metal in the form of chips. Thread rolling and spline rolling are examples of chipless machining processes in common use.

But in spite of all the advancements made in recent years in machine design, our progress is dependent to just as great an extent on accompanying changes in the design and materials used for making the cutting tools. For years, high-speed steel was the basic tool material. Vanadium toolsteels, high cobalt-vanadium steels and the German-developed tungsten carbides made their contributions to more efficient machining during the 1930's. Later, through improved manufacturing control, the life of tungsten carbide tools was increased until this material has become the backbone of mass production in the machine shop. More recently, the carbide family has been augmented through the introduction of titanium carbides, sometimes alloyed with molybdenum or tungsten carbides, which are expected to contribute much to higher speed cutting.

Another recent contribution of European development is the oxide or ceramic tool tip. The greatest advantage of the oxides (aluminum, silicon and magnesium) is their ability to withstand high temperatures; their big problem is brittleness. Most of the oxide tool tips are "throw-aways" since it is usually less expensive to discard them than to sharpen them.

Even that old standby, the twist drill, is undergoing basic design changes. The recently developed spiral point drill and the star bore drill appear to offer great advantages over the traditional chisel point drill.

Lubricants and coolants have also been subject to considerable research in recent years and gaseous coolants, such as CO_2 and the aerosol type, are being used to a much greater extent.

Mr. Witsche devoted the next part of his talk, illustrated by an excellent film, to machining developments of recent years, especially those based on electrical erosion, electrolytically assisted grinding, electromechanical and mechanical erosion.

To conclude, Mr. Witsche spoke of the contributions being made by metallurgists. The ultimate in increased machining speed and reduced machining cost is dependent on the metal producing industry providing material in which the variables of chemical and physical composition are as carefully controlled as is practical. Over the years, metallurgy has made tremendous advances in guaranteeing the minimum quality of the material in the product. It is now necessary, if the minimum cost of processing is to be achieved, to even more clearly and exactly define its maximum characteristics.—**Reported by D. F. McLeod for Montreal.**

Potential of Mining in P.Q. Outlined at Quebec

Speaker: A. O. Dufresne

Deputy Minister of Mines

A. O. Dufresne, Deputy Minister of Mines, Quebec, spoke on "Mining and Development" at a meeting of **Quebec Chapter.**

The mining potential of the Province of Quebec is probably one of the most attractive in the world. Although it stands second among the Canadian provinces in the production of minerals, this position will likely be reversed when the interior of the province becomes more accessible. A glance at the map of Quebec showing the centers of population and mining activities indicates that only the edges have been exploited to date.

Asbestos, vital to the building industries, is currently the mineral of greatest value produced. Over one million tons of asbestos fiber were produced in the Eastern Townships area during 1957. One mine has a daily production greater than 20,000 tons. Many other minerals are produced in lesser quantity. One of increasing value and strategic importance is iron ore. Iron ore from Quebec will become of increasing importance as steel production rises and as the amount of ore available from traditional sources on this continent, such as the Mesabi area, dwindles.

This province was originally explored and settled by farmers and fur traders. Regions which were difficult to reach remained largely unknown until modern methods of transport and exploration were employed. With the recent discovery of commercially feasible iron ore deposits in remote areas, new roads, railroads, harbors and airports have been built. The plentiful hydroelectric power sources in these remote regions will assist the establishment of new mining centers around the newly developed mineral sources, providing stable employment for increasing numbers of people.—**Reported by C. Briercliffe for Quebec.**

Details Functions of Nonferrous Elements in Ferrous Metallurgy

Speaker: G. E. Willey
Electro Metallurgical Co.

G. E. Willey, vice-president, Electro-Metallurgical Co., presented a talk on the "Functions of Nonferrous Elements in Ferrous Metallurgy" at a meeting held by **Ontario.**

Dr. Willey introduced his subject by considering the fundamental attempts to classify the function of alloying elements in iron and steel, both from the point of view of structural characteristics and properties. Most steels start from pig iron containing 4% carbon which is refined to given carbon contents for specific applications. The industry, by variations in production techniques, can provide the most versatile materials known—iron and steel. Of this production only 10% is alloyed with other elements to produce alloy irons and steels. On the other hand, elements other than carbon are also added for other than alloying purposes. Deoxidation uses quantities of aluminum, silicon, manganese, calcium, titanium and zirconium. Tin, zinc, copper, cadmium and lead are used for surface coatings.

Deoxidation of steel is progressive, producing successively rimmed, semi-killed and killed ingots, with reducing yield but increasing soundness.

When carbon steels are inadequate in properties, alloy steels are produced and each addition has a specific influence. The four representative types of addition will raise or lower the critical temperature and either form compounds or solid solutions. Type 1 includes manganese, nickel and cobalt. They widen the range for stable austenite. Type 2 also performs this function but forms staple compounds and includes copper, zinc, gold, nitrogen and carbon.

Type 3 narrows the stable austenite range, eventually becoming ferritic. These are silicon, chromium, tungsten, molybdenum, phosphorus, vanadium, lithium, beryllium, tin, antimony, arsenic and aluminum.

Type 4 is similar in effect but forms compounds and includes tantalum, zirconium, boron, sulphur and cerium.

This tabulation refers to equilibrium conditions, and production cooling rates can and do vary the effects expected. The state of deoxidation will also have an effect, and the concentration of other elements will vary the presence of an addition in a particular phase.

Carbide-forming elements, for example, may be forced into the ferrite in the presence of a stronger carbide element and will also tend to go into solution at elevated temperatures. All are soluble to some extent in ferrite. Those with the greatest solubility have the most effect on hardness and strength. Carbides have a similar effect on alloy steels as on carbon steels and can affect special properties such as abrasion resistance. Inclusions of oxides, sulphides, silicates, alumina and graphite may have both harmful and helpful characteristics.

Intermetallic compounds, such as nickel-alumide or nitride, and age hardening compounds of iron with titanium, tungsten, molybdenum or beryllium, can increase mechanical properties. Dissolved elements have significant effects, a remarkable one being the protective surface film formed when one atom of chromium is in ratio to seven atoms of iron. Phosphorus and copper cause rust resistance, and silicon in electric steel is of vast importance for its effect on magnetic and resistance properties. Finally, the effect of alloy elements on critical cooling rates was discussed, exemplified by chromium and nickel. The sometimes neglected factor of the effect of alloys on Ms temperature leading to high residual stress and cracked parts as a result of low Ms temperatures was emphasized. Dr. Willey concluded his talk by discussing the individual and frequently quite opposed effects of varying alloy metals that may be present or deliberately added to steel compositions. — **Reported by H. G. Warrington for Ontario.**

Awarded Scholarship at San Jose

Shown During the Presentation of the First Annual National A.S.M. Scholarship at San Jose State College Are, From Left: Malcolm Davis, Chairman, Student Affairs Committee; William Nix, a Junior Majoring in Metallurgy, Recipient of the Award; James Anderson, Professor of Metallurgy; and Ralph Parkman, Chairman of the Santa Clara Valley Chapter, Professor of Metallurgy at San Jose State College. (Reported by Malcolm Davis)

Talks on Ultra-High-Strength Alloys

Peter Payson, Manager of Research and Development, Crucible Steel Co. of America, Spoke on "Ultra High Strength Alloy Steels" at a Meeting of North Texas Chapter. Pictured are, from left: Ross Cummings, Crucible branch manager; Albert S. Holbert, chairman; Mr. Payson; and Stephen Maszy, treasurer. (Report by J. P. Fowler for North Texas)

Discusses Bearing Material

Ralph E. Lee, Jr., (Left), General Electric Co., Spoke on "Materials for High-Temperature Bearing Applications" at a Meeting of Fort Wayne. He is shown with Russell Thomas, technical chairman of the meeting

Talks on High-Strength Steels

O. O. Miller (Left), International Nickel Co., Inc., Who Spoke on "Ultra-High-Strength Steels" at New Jersey, is Shown With Chairman Stan Lindstrom During a Meeting Held Recently by the Chapter

Speaker: R. E. Lee, Jr.
General Electric Co.

Ralph E. Lee, Jr., bearing materials engineer, General Electric Co., spoke on "Materials for High-Temperature Bearing Applications" at a meeting in **Fort Wayne.**

Conventional lubricants break down at the higher temperatures. Considerable work is being conducted to develop special high-temperature lubricants and high-temperature materials are being developed which can operate dry. High-temperature bearing materials must have high compressive and fatigue strength, high thermal conductivity, high hot hardness, dimensional stability, oxidation resistance and components with comparable coefficients of thermal expansion.

Work is in progress to improve and develop materials for high-temperature applications. For example, retention of hot hardness was improved up to 500° F. by small additions of aluminum to AISI 52100 ball bearing steel. Because clean bearing steel has been considered a major factor in reducing fatigue failures, especially in the use of toolsteels as ball bearing materials, conventional vacuum melting of bearing steels and vacuum melting by the consumable electrode process have shown promise for improvement of fatigue life scatter.

Metal-glass composite bearings are another approach to improving high-temperature bearing systems. The composite can be made by infiltrating a porous structure with glass or by compacting and sintering the metal and glass by powder metallurgy techniques. The glass becomes fluid at the higher temperatures and acts as a lubricant for the bearing. This system presents problems, such as solidification of the glass at low temperature and the consequent bearing freeze-up, but heating elements in proximity to the bearing helps to overcome this.

Air-lubricated bearings have been applied to journal and thrust bearing applications. When pressurized air is pumped from an external source through feed holes in the bearing walls to the clearance space between bearing and shaft, the bearing is said to be hydrostatic. This hydrostatic gas pressure supports the bearing shaft and its load.

The hydrodynamic air bearing is self-acting in that it generates its own hydrodynamic pressure field in the converging part of the clearance space by virtue of the viscosity of the air in which it is immersed and the relative motion of the bearing elements.

Bearing materials are needed that will not oxidize excessively as clearances and feed holes are critical. Comparable coefficients of thermal expansion for shaft and bearing are necessary to maintain predesigned clearances. Wear resistant materials are needed so that excessive wear will not occur on starting up, and stopping, or if the journal were to strike the bearing wall during load reversal conditions. Bronzes, and nickel and cobalt-base alloys, are among materials being considered for bearing materials.

Liquid metals are being considered as a lubricant where it is desirable to run journal or thrust bearings at high temperatures under hydrodynamic conditions. Here the liquid metal acts the same as oil in that a load-supporting film is generated.

The behavior of some materials at high temperatures is often quite surprising. Sliding tests were conducted on several nickel-base alloys and the effect of temperature on the coefficient of friction was studied. At the higher temperatures during cyclic temperature testing, the coefficient of friction decreased by as much as 40% of its original low-temperature value. This was attributed to the shearing at the higher temperatures of a low-strength oxide film. Upon decreasing the temperature, the friction would increase to a level comparable to its room-temperature friction value.

Tests were also conducted to evaluate wear and surface destruction of various materials under boundary conditions in MIL 7808 oil at 350° F. Many of the coated materials failed while the toolsteels and cobalt-base alloys performed quite well. A new material consisting of a porous carbide structure that had been infiltrated with a steel bond also performed well. An advantage of this material is that it can be heat treated while most of the conventional carbides can not.—**Reported by N. L. McClymonds for Fort Wayne.**

Ladies Hear Talk on Gems

The Ladies Night Meeting of the **Dayton Chapter** featured a talk on "Gem Cutting" by J. C. Free of the J. C. Free Manufacturing Co.

Members and their wives saw a movie that covered the diamond industry from mining to gem cutting. Mr. Free then described the art of gem cutting and gave a history of the world's famous diamonds.—**Reported by D. M. Ashfal for Dayton.**

Entertain Ladies

In spite of wintery temperatures of 17° below zero and heavy winds, about 200 members and guests were on hand to enjoy the Ladies Night meeting held by the **Manitoba Chapter.** Each lady was presented with a rose as she entered the decorated hall, and prizes of jewelry and dishes were given to many. Following the dinner, the ladies and their escorts enjoyed dancing and entertainment.

Meet Your Chapter Chairman

CHICAGO-WESTERN

JAMES F. SCHUMAR, associate director, metallurgy division, Argonne National Laboratory, assists in the direction of research and development on materials used in nuclear reactors. He is a native of Elyria, Ohio, and received his B.S. degree from Case Institute of Technology in 1939.

Mr. Schumar was formerly associated with the Wolverine Tube Co., where, as senior metallurgist he was responsible for jacketing the uranium fuel rods that were used in the Argonne heavy water reactor, which resulted from early development work on the fabrication of uranium, thorium and beryllium.

Uranium fuel rods for the Laboratory's experimental breeder reactor, now located at Idaho Falls, were developed and jacketed under Mr. Schumar's direction. He has contributed to the design and development of fuel rods and other reactor components for the submarine thermal reactor, the Argonne-duPont reactor and other proposed reactors.

Mr. Schumar has been vice-chairman and member of his Chapter's executive committee. His family consists of Kathleen, 12, Maureen, 4, Michael, 8, and twins, James, Jr., and Mary Beth, approaching their first birthday.

PHILADELPHIA

F. JEROME WHITNEY, JR., was born in Philadelphia. He was manager of varsity basketball during his undergraduate days at Lehigh University where he obtained the degrees of B.S. in electrical engineering and M.S. in metallurgy. His first work was as a welding engineer and he moved along through chief metallurgist, technical advisor to works manager, assistant works manager, manager of contract terminations. He is now president of the Pennsylvania Hardware Manufacturing Co.

Mr. Whitney has served his Chapter in many ways, having been chairman of the special lecture committee, and a member of the finance, nominating, membership, program and library committees.

Jerry has a son, John, 13 years old. They both enjoy baseball and fishing and like to travel.

CEDAR RAPIDS

RICHARD PUGH, engineer with Collins Radio Co., was born in Williamsburg, Iowa. He holds the degrees of B.A. in economics and B.S. in engineering from the State University of Iowa, and M.S. degree in mechanical engineering from the University of Rochester.

Before coming to his present position he was with Convair at Fort Worth in stress analysis and structural testing, with Cherry-Burrell Corp. in product design, and was engineering professor at the New Mexico School of Mines, University of Rochester and New Mexico College of A. & M. A.

Mr. Pugh is a member of Cedar Rapids Engineers' Club, Iowa Engineering Society, and is a registered engineer in both civil and mechanical engineering. He is a bachelor.

ROME

HARRY J. HAMJIAN was born in Auburn, N. Y. He received his degrees, B.S. in chemical engineering and M.S. in metallurgical engineering, at the University of Michigan. Professional experience includes chemical engineer with the Manhattan Engineering Project and research scientist for National Advisory Committee for Aeronautics. He is now manager of vacuum melting operations for Kelsey-Hayes Division of Utica Drop Forge & Tool Co.

Mr. Hamjian has patented a method of forming articles from comminuted material and one for making die inserts. He contributes technical articles to the *Journal of Metals, Journal of American Ceramics Society, Product Engineering* and *Iron Age.*

He and his wife enjoy music, golfing and gardening, and he is active on the Faxton Hospital Council.

AKRON

MANUEL GOLDMAN, metallurgist in the technical service department, Goodyear Aircraft Corp., was born in Boston. His studies at Boston University were interrupted midway by several years in the U. S. Army Signal Corps. After completing his military service he returned to the university and graduated with a B.A. degree, and later went on to Tufts College for an M.S. degree.

Mr. Goldman worked in the physical metallurgy branch at Watertown Arsenal and in the ferrous metallurgy department at Battelle Memorial Institute before taking his present position in 1953.

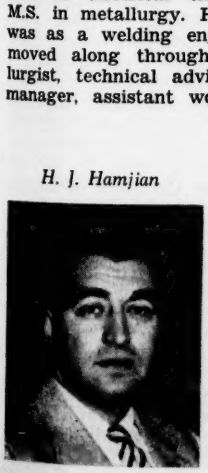
His family consists of Ava, 7, Cheryl, 5, and Brian, 2 years old.

SANTA CLARA VALLEY

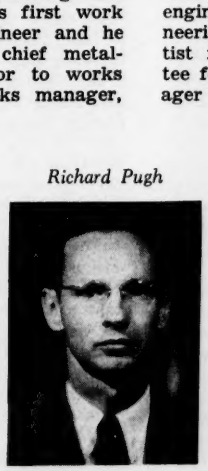
RALPH PARKMAN, associate professor of engineering at San Jose State College, is a native of Penzance, Cornwall, England. He has been a metallurgist with Crucible Steel Co. and at one time had an electroplating business in Los Angeles. He holds a B.S. degree in metallurgical engineering from University of Pittsburgh and, while serving as research assistant and faculty member at Stanford University, he received his M.S. and Ph.D. degrees in metallurgical engineering.

Mr. Parkman was temporary chairman during organization of the Chapter and is active in the American Welding Society as education chairman and section representative to national educational activities committee. He served in the Southwest Pacific during World War II in the U. S. Navy. For recreation he enjoys fishing and hiking in Sierra Nevada. His one son, Philip David, is almost two years old.

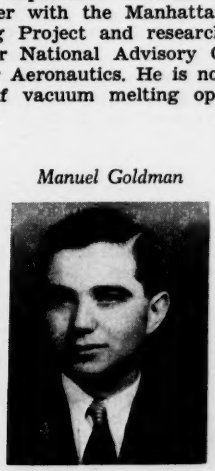
H. J. Hamjian



Richard Pugh

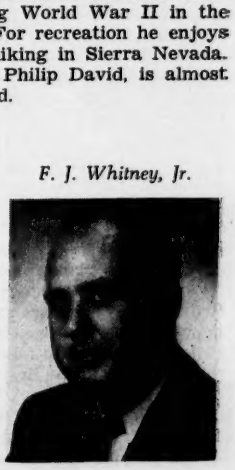


Manuel Goldman



J. F. Schumar

F. J. Whitney, Jr.



At Zay Jeffries Night in Cleveland

The Zay Jeffries Night Meeting of the Cleveland Chapter Featured a Discussion on "Trends in Metallurgical Engineering" by Joseph W. Spretnak, Professor and Research Supervisor at Ohio State University. He supplemented his talk with a comparison between current American and Soviet thoughts concerning metallurgical curriculum and basic pre-engineering education. Shown are, from left: E. C. Smith, Republic Steel Corp.; J. V. Emmons, Cleveland Twist Drill Co.; Dr. Spretnak; C. H. Junge, Cleveland Graphite Bronze Co.; and K. J. Humberstone, American Tank & Fabricating Co., Vice-Chairman. (Report by J. Shepard)

Discusses Hydrogen In Heavy Forgings

Speaker: J. E. Steiner
U. S. Steel Corp.

J. E. Steiner, research engineer, forgings, applied Research Laboratory, U. S. Steel Corp., spoke recently before the **Lehigh Valley Chapter** on "Hydrogen in Heavy Forgings".

Mr. Steiner explained that hydrogen has been recognized for a number of years as a harmful element in heavy forgings. It is responsible for the formation of flakes and also adversely affects transverse ductility.

The most generally accepted explanation of flaking is that flakes are formed through a combination of hydrogen embrittlement and stress. The stress can be simple thermal stress as a result of cooling, or transformation stress, or a combination of both. In Ni-V-Mo forgings a definite relationship has been observed between hydrogen content and transverse ductility (reduction of area). Artificial aging of the tensile bar (i.e., baking at 500° F. for 1 hr.), reduces the hydrogen content of the bar and produces a high level of ductility. It should be pointed out that although the Cr-Mo-V steel is similarly sensitive to hydrogen embrittlement, the presence of hydrogen in Cr-V-Mo rotors does not appreciably affect the ductility levels. Also Cr-V-Mo forgings are not susceptible to flaking unless badly maltreated. The reason for the different behaviors of these two heavy forging grades is not known, although there has been some indication that retained austenite in the Ni-V-Mo grade may have a bearing on this matter.

Since hydrogen has a high rate of diffusion, it is expected to segregate. An example of the cross-sectional distribution of hydrogen was given for a 49 in. Cr-V-Mo rotor. The distribution of hydrogen was low near the surface, about 1 ppm., and increased rapidly to a level of 5.5 ppm. at the center.

The distribution of flakes was shown in a condemned Ni-V-Mo rotor. The pattern was located within approximately a one-third radius of the center and was confined well within the ends of the main body. The flakes are contained internally and will not appear at the surface of a forging unless uncovered in subsequent machining operations. Flakes tend to be circular in shape and can be of varied size. If flaking occurs in pieces with pronounced directional characteristics, it is common for the flakes to follow the flow lines. They are also very prone to form along segregated streaks.

Flakes can be prevented in heavy forgings by adequate heat treatment immediately after forging. Since hydrogen diffuses most readily at temperatures just below the critical, heat treatment cycles employing very slow cools and isothermal holds are commonly used. When the incidence of flaking increases, it is the usual practice to make further extensions to the treatment cycles to remedy it.

Mr. Steiner presented curves showing the typical behavior of hydrogen during melting in the basic open-hearth and electric furnaces. Various factors which influence the hydrogen content and certain methods of control were discussed.

The most recent method of minimizing hydrogen and the most effective is vacuum degassing. In this process the steel is melted in accordance with regular practices and is poured into a mold placed in a large vacuum tank. The stream of molten metal is degassed as it is poured from an intermediate ladle atop the vacuum tank through the vacuum chamber in which the mold is placed. The hydrogen content is reduced to approximately 1 ppm. by the process. At this level of hydrogen, the steel is not prone to flaking and the transverse ductility is equivalent to that obtained on artificially aged specimens.

Mr. Steiner described a "flake sensitivity test", developed by U. S. Steel Corp., wherein a material could be rated as to its susceptibility to flaking. The test consists of forging a series of blocks from an ingot and cooling these blocks at different rates. The blocks cooled at extremely slow rates are usually free of flakes, whereas, with faster cooling rates, the number of flakes increases and their size decreases. The index of flake sensitivity is the reciprocal of the cooling rate which first produces flakes. This index can be related to the hydrogen content of the steel or other variables. However, since the development of vacuum pouring the need for these studies has diminished.

The actual flaking of a water-quenched block was shown in a time-lapse movie. Immediately after water quenching an ultrasonic crystal was placed in contact with the block. A movie camera was directed at the oscilloscope and time lapse exposures were made over a period of 30 hr. As the test started, two back reflections were clearly visible on the scope. As flakes continued to form the back reflections decreased until they disappeared entirely. There were no sonic indications from the flakes due to the angle in which the flakes occurred in relation to the sonic beam. However, as evidenced from the loss of back reflection the flakes totally scattered the sonic beam.—**Reported by H. C. Smith for Lehigh.**

Materials for Rocket Engines Subject at Utah

Speaker: E. J. Berret
Thiokol Chemical Corp.

Eugene J. Berret, Thiokol Chemical Corp., Utah Division, gave a talk on "Selection of Metals in Solid Propellant Rocket Engine Design" at a meeting held by the **Utah Chapter.**

Mr. Berret introduced his talk with an Army Ordnance film showing charge designs and general construction of the engines. He discussed experiments being done in an effort to increase the ratio of charge weight to the total weight of the engine and to increase the life of parts which are subjected to temperatures up to 5000° F. The principle of the engine was explained and the parts which fail were pointed out. Tentative specifications for materials to be used in the different parts were given, including yield strength steels of 165,000 to 180,000 psi. or higher. Fabrication difficulties were also mentioned. —**Reported by H. E. Flanders for Utah Chapter.**

To Judge Gregory Award

G. M. Young, president A.S.M. and technical director, Aluminium Co. of Canada, Ltd., has appointed four well-known metal industry leaders to serve under the chairmanship of Clarence H. Lorig, assistant director, Battelle Memorial Institute, as judges for the second annual $1500 Gregory Award competition. The committee, which will select the "year's most outstanding contribution in the field of semi-automatic electric arc stud welding" includes: Robert Bennett, chief metallurgical engineer, Alco Products Inc., Theodore L. Oberle, staff metallurgist, Research Division, Caterpillar Tractor Co., Gustav Schrader, director of manufacturing, Steel Improvement & Forge Co., and Wilson Scott, metal joining section, Westinghouse Electric Corp.

Dr. Lorig, who is also vice-president A.S.M., has urged persons interested in the competition to submit entries well in advance of the July 31 deadline to expedite the judging. The award will be presented at the 1958 Award Luncheon of the American Society for Metals, in Cleveland, Oct. 28, 1958. Information on the competition may be obtained from Gregory Industries, Inc., Lorain, Ohio, manufacturers of Nelson stud welding equipment.

Analyzes High-Strength Steels at Puget Sound

Speaker: John Hamaker

Vanadium Alloys Steel Co.

Puget Sound Chapter members heard John Hamaker, Jr., Vanadium Alloys Steel Co., speak on the trend in "High-Strength Steels for Aircraft and Other Elevated Temperature Applications" at a recent meeting.

He discussed the 5% chromium steel known as Vasco-Jet 1000 in some detail, and forecast future developments for high-strength steels. Dr. Hamaker stated that 5% chromium steel has been known and used for a great number of years, but has recently found a real place in aircraft structures. The excellent mechanical properties obtainable after an air quench and temper at approximately 1000° F. is a strong point in favor of its use at both room and elevated temperatures. The high tempering temperature also allows the use of protective finishes such as diffused Ni-Cd with freedom from hydrogen embrittlement.

The secondary hardening phenomenon present in the steel was shown to be advantageous both from a standpoint of a high tempering temperature and freedom from retained austenite.

Dr. Hamaker visualizes the development of steels with high strengths (up to 300,000 psi. ultimate) which may resist softening upon reheating up to the rehardening temperature (approximately 1400° F.)—**Reported by E. E. Bauer for Puget Sound.**

Compares Western-Russian Metallurgy

J. H. Hollomon, Metallurgy and Ceramics Research Department, General Electric Co., Compared "Russian and Western Metallurgy" at a Santa Clara Valley Meeting. Shown are, from left: M. J. Sanderson, General Electric Atomic Laboratory; Mrs. and Dr. Hollomon; and R. A. Smith, treasurer

Speaker: J. H. Hollomon

General Electric Co.

J. H. Hollomon, manager of the metallurgy and ceramics research department, General Electric Co., and national trustee A.S.M., compared "Russian and Western Metallurgy" at a meeting of the **Santa Clara Valley Chapter.**

Summarizing observations which he made during his visit to Russia, as guest of the Russian Academy of Science, Dr. Hollomon stated that the growth of the Russian metallurgical effort compared to the West is very large. The Russians are training more than two to three times the number of metallurgists than all of the Western countries combined. They offer their educational facilities to students of the countries that are friendly to them. The total amount of research now done in Russia probably exceeds that of the West in some fields, in quantity but not quality. Russian metallurgists are concentrating on translating Western developments to practice, not so much on basic metallurgical science.

In addition to his discussion of Russian advances in metallurgical practice and education, Dr. Hollomon presented an interesting description of Russian life and industry with a series of slides taken during his stay in Russia.—**Reported by M. J. Sanderson for Santa Clara Valley.**

Presents Charter at Richmond

S. F. Radtke, Reynolds Metals Co., Chairman, Is Shown Receiving the Charter of the Richmond Chapter From National President G. M. Young at the Charter Night Meeting. W. F. Smith, secretary, and W. H. Eisenman, national secretary, look on. Following the presentation and acceptance, Mr. Eisenman discussed the results of a recent survey concerning salaries and jobs in the metalworking industry. He also showed slides of the new A.S.M. headquarters building. Mr. Young spoke on "Light Metals in Heavy Industry". (Reported by W. W. Berkey for Richmond)

Points Out Dangers of Radioactivity

J. J. Nickson, Memorial Hospital, Discussed the "Physiological Effects of Radioactivity" at a Meeting in New York. Shown are, from left: E. R. Jette, technical chairman; Dr. Nickson; and W. J. Kennelly, Jr., chairman

Speaker: J. J. Nickson
Memorial Hospital

E. R. Jette, director of the Union Carbide Research Institute, and technical chairman at a meeting of **New York Chapter,** opened the meeting with a discussion of the different types of radioactive particles. He pointed out that two radiation hazards exist—one from dust problems or fallout, the other from direct radiation. He discussed the problems run into by metallurgists and indicated the dangers they are exposed to because of the quantities of radioactive material they handle when working on projects related to radioactivity. He then introduced J. J. Nickson, chairman of the Radiation Therapy Department, Memorial Hospital, who spoke on the "Physiological Effects of Radioactivity".

Dr. Nickson discussed what can happen to a man exposed to radioactivity. Changes in skin, changes in hair, damage to the gastro-intestinal tract, formed cells in the blood, damage to gonads, as well as changes or damage to other parts of the body, can occur.

Dr. Nickson then discussed the maximum permissible dose of radiation that can be tolerated without damage. According to the speaker, any answer to this question is really no more than an educated guess. In 1902, the maximum dose was considered to be 3000 R per year; in 1921 it was reduced to 30 R per year; in 1931 to 0.2 R per day; in 1936 to 0.1 R per day; and during the war years to 0.5 R per day (2 R per year). In 1957 the limit was set at 5 R per year.

In discussing the continuing danger and possible cures, Dr. Nickson said that somatic damage has a regenerative factor—damaged cells can be rebuilt or replaced. Genetic damage, however, is not regenerative but additive, and it can continue to increase with further exposure.

It will take several generations of medical research activity to determine answers to many of today's problems. Biological effects due to radioactivity can be hidden for 100 generations. Genetically, it is no longer safe to think back to grandparents or look ahead to grandchildren for hereditary effects.—**Reported by A. S. Cohan for New York.**

Springfield Shows Film On Aluminum Finishes

The Aluminum Co. of America's film "Color and Texture in Aluminum Finishes" was featured at a recent meeting of the **Springfield Chapter.** It covered anodized finishes produced by electrolytically oxidizing the surface of aluminum, providing a film which retains certain organic dyes and mineral pigments. Similar but thicker oxide surfaces provide wear resistance. The colored anodized finishes have the advantage of retaining the texture mechanically developed in the aluminum prior to application of the coating. The architectural finishes will not chip or peel away and are durable and weather resistant. Other finishes for aluminum include fused porcelain enamel, paint, lacquer and plastic coatings. Hard chrome is plated over a layer of zinc for wear resistance and silver plating is used where high surface conductivity is a requirement. Tin, brass and cadmium are also plated on aluminum.

A question and answer period followed the film. Moderator was Bernard C. Mullen, branch manager for Alcoa. Panelists were Ernest Brix, Hampden Brass and Aluminum Co. and R. N. Vanden Berg, of Alcoa's New Kensington laboratories. Questions brought out the fact that light fastness of the anodized finishes is best when the alloy constituents of the aluminum are utilized in producing the color. Thus, silicon as an alloying element gives a very permanent gray or brown color. Vat dyes are very light fast but find limited application because they must be deposited from an alkaline solution. The acid salts are therefore more widely used, phthallocyanine blue being a very stable example of these. The mineral pigments are the most light fast of all, such as the golden tones obtained from ferric-ammonium oxalate, which decomposes to yield ferric oxide.

For partial coloring of objects, the entire part is first anodized, colored and dried. The portions which are to retain color are sprayed with an air-drying asphaltum, followed by immersion in nitric acid which removes color from the exposed areas. After rinsing, the asphaltum is stripped by a toluene solvent and the remaining color sealed in place by conventional means.

The coloring of die castings is best accomplished with low-silicon alloys. Silicon, present in die casting alloys because it improves fluidity, produces an undesirable opaqueness in colored die castings. For instance, the recommended material is alloy A214 (0.30% Si) as opposed to 13 alloy (12% Si) and 360 alloy (9.5% Si). Vacuum die casting using a 4% Zn, balance aluminum alloy may be a solution to the problem.

When titanium racks are used for anodizing, excessive current densities should be avoided as this produces a nonconducting blue oxide coating on the rack which must be mechanically removed.—**Reported by J. H. Pfarmeister for Springfield.**

Briefs Syracuse on Hardness Testing Methods

Speaker: V. E. Lysaght
American Chain & Cable Co.

V. E. Lysaght, general sales manager, Wilson Mechanical Instrument Division, American Chain and Cable Co., spoke on "Hardness Testing" at a meeting in **Syracuse.**

Mr. Lysaght defined hardness as resistance to permanent deformation by an indentor of fixed size and shape under a certain load. This measurement is primarily used for control purposes of heat treatments, cold work or both. The values can be transferred approximately to tensile strengths and converted to other scales but discretion must be utilized.

The methods used for hardness testing were discussed as were the many factors affecting the resulting hardness readings, such as time of specimen under load, rate of application, and spacing of indentations.

Mr. Lysaght also discussed factors which could cause erroneous readings in sheet and rounds. Mention was made of microhardness testing, special fixturing and automated hardness testers. Slides were shown throughout the talk depicting various points discussed. — **Reported by G. Trojanowski for Syracuse.**

Defines Metals for Space Age at Meeting of Chicago-Western

Speaker: D. W. Levinson

Armour Research Foundation

"Metals for Rockets, Guided Missiles and High-Speed Aircraft" was the topic presented by D. W. Levinson, supervisor, nonferrous Metals Research, Armour Research Foundation, at a **Chicago-Western Chapter** meeting.

Impressive developments have been made since the first airplane flew 55 years ago; however, conventional materials are still in use in areas where they should not be. In general, there are three areas in which the problems lie and must be solved: (1) power plants, (2) airframe aerodynamics, and (3) materials to make power plants and airframes.

Since horsepower has gone up very rapidly in the last 15 years, whereas power plant package size has not, engine operating temperature and working stresses have increased appreciably.

Aerodynamic design of airframes has progressed with speed and thus conventional materials are adequate for speeds up to 2000 mph.; however, at higher speeds, air friction generates temperatures which may preclude the use of conventional materials. This problem is lessened as the missile is made to fly at higher elevation, but there remains the problem of coming back into the atmosphere. The same atmosphere which protects us from meteorites by destroying them through rapid oxidation will also burn up missiles unless new high-strength oxidation resistant materials are developed.

A slide of short-time density-corrected tensile strength versus temperature for several materials revealed that the mechanical properties of aluminum and magnesium alloys drop appreciably between 200 and 400° F., those of stainless steels and titanium alloys between 800 and 1200° F., and finally the superalloys retain their properties up to 1400° F. However, in time-dependent applications these materials are useful at approximately 30% of their tensile strength to temperatures up to where the properties drop severely. This is due to their low creep strength.

In conjunction with time-dependent elevated temperature mechanical properties, scaling and corrosion resistance are imperative in view of the high operating temperatures and the highly corrosive products of combustion. Unfortunately, many metals which retain their mechanical properties at high temperatures do not form protective oxides.

Significant changes are now being made in high-temperature alloy development. Ternary and dispersion additives further improve their properties. Some recently developed titanium-aluminum, iron-aluminum and iron-chromium-aluminum alloys have remarkably good oxidation resistance, a property which makes them potential cladding materials.

In the future the refractory metals, rhenium, tungsten, molybdenum and columbium must be considered in spite of their poor scaling properties. Tungsten and rhenium appear to exhibit the best high-temperature mechanical properties. Scaling protection must be afforded to these metals by alloying, cladding or refractory coating. Dr. Levinson discussed an approach to refractory coating which he is investigating. Briefly, a coating of alumina is sintered on molybdenum and, since the latter has a higher coefficient of expansion, the refractory is under compression and thus forms a compact layer which is equivalent to a protective scale.—**Reported by D. J. Garibotti for Chicago-Western Chapter.**

Describes Induction Heating Progress

H. B. Osborn, Jr. (Left), District Manager, Tocco Division, Ohio Crankshaft Co., Spoke on "Latest Developments in Induction Heating" at a Meeting of Chicago-Western. He is shown with P. E. Bjork, technical chairman

Speaker: H. B. Osborn, Jr.

Ohio Crankshaft Co.

"Latest Developments in Induction Heating" were covered at a meeting of **Chicago-Western Chapter** by H. B. Osborn, Cleveland district manager, Tocco Division, Ohio Crankshaft Co.

Dr. Osborn explained the basic principles of induction heating by stating that the induction coil and the workpiece constitute a transformer with the former acting as the primary and the latter as the secondary. Thus an alternating current forming in the primary, or coil, sets up an electromagnetic field which causes I^2R losses in the secondary, or workpiece, heating it to the desired temperature.

Dr. Osborn then described the three power sources of high frequency and their characteristics: (a) motor-generator sets which operate from one to 10 kilocycles; (b) spark-gap oscillators which operate from 60 to 400 kilocycles; and (c) vacuum tube oscillators which operate from 450 to 500 kilocycles. Of the three the motor generator sets are the most efficient. The other two are nearly equal in efficiency; however, the spark gap oscillators are not used too frequently now because they interfere with radio and T.V. reception.

Frequency and time are the primary factors which determine depth of heating for a particular material and diameter of workpiece. Formulas correlating the above variables were presented. Thus a ½ in. diameter steel rod would through harden in 1-2 sec. in a unit operating at 2 kilocycles, whereas in a unit oscillating at 10 kilocycles, it would surface harden.

A number of slides were shown demonstrating the improvements in fatigue strength which result in parts induction hardened. Other advantages to be gained from induction heating mentioned were fast heating rates, ease with which induction coils can be designed for most workpieces, uniformity of results, minimal scaling or decarburization, speed of processing, adaptability to the processing line and low cost per workpiece unit. The main disadvantages are the initial installation and tooling cost.

Dr. Osborn concluded by illustrating various fields of application of induction heating such as selective hardening, tempering, annealing, heating for forging, heating of aluminum extrusion slugs, vacuum induction melting, brazing, etc.—**Reported by D. J. Garibotti for Chicago-Western.**

Speakers Cover Modern Research Techniques

Speakers Who Presented Lectures on "Modern Research Techniques" During the Educational Course Sponsored by the Oak Ridge Chapter Were, From Left: W. C. Koehler, Physics Division, and U. L. Scott, Metallurgy Division, Oak Ridge National Laboratories; M. H. Hablanian, NRC Equipment Corp.; M. B. Bever, Massachusetts Institute of Technology; W. C. Thurber and H. L. Yakel, Metallurgy Division, O.R.N.L.; W. C. Bigelow, University of Michigan; and H. Inouye and R. J. Gray, O.R.N.L.

The **Oak Ridge Chapter** has recently completed a series of educational lectures on "Modern Research Techniques" covering the major developments during the past five years in experimental research techniques and their applications in the study of the physics, chemical and physical metallurgy of metals.

At the first session, M. H. Hablanian, NRC Equipment Corp., spoke on "Vacuum Technology". He described new equipment and techniques, on both an industrial and laboratory scale. Of special interest were the discussions of the use of Root-type blowers in conjunction with conventional mechanical and diffusion pumps and of the operational characteristics of new vacuum gages.

W. C. Koehler, Physics Division, Oak Ridge National Laboratories, discussed "Neutron Diffraction". The applicability of this technique to the solution of structural problems which cannot be solved by X-ray diffraction, especially where the atomic scattering factor for X-rays of one of the elements is relatively very small, was stressed.

The "Use of Radioisotopes in Physical Metallurgy" was the subject of the talk by M. B. Bever, Massachusetts Institute of Technology, who gave a short history of the development of tracer techniques and concluded with demonstrations of specific applications of these techniques.

H. L. Yakel, Metallurgy Division, Oak Ridge National Laboratories, presented a talk on "X-Ray Diffraction". Basic principles of X-ray diffraction were first discussed and then the use of diffraction techniques as a tool for both basic research and general service work was reviewed.

R. J. Gray, Metallurgy Division, Oak Ridge National Laboratory, described "Optical Metallography". He explained and illustrated new developments in tools and techniques for polishing and etching.

"Electron Microscopy and Diffraction" were covered by W. C. Bigelow of the University of Michigan. The phenomenal rise of this research tool which until recently was neglected by the metallurgists and solid state physicists in this country was discussed. Replication and electron diffraction techniques were reviewed and results of the newest techniques were illustrated.

The series was open to the public and certificates were awarded to those attending all of the sessions.—**Reported by P. L. Rittenhouse for Oak Ridge Chapter.**

Discusses Furnace Design at Philadelphia Meeting

Speaker: F. O. Hess

Selas Corp. of America

Frederic O. Hess, president, Selas Corp. of America, discussed "Recent Developments in Continuous Furnace Design" at **Philadelphia.**

The talk was limited to gas-fired furnaces of the types used with metals or where metals play a part. He emphasized two major points: (1) Economics are not adequately considered when engineering and evaluating furnace performance; and (2) the continuous furnace should be classified as a processing tool. He presented many slide-illustrated examples to support these statements.

F. O. Hess

In one case, management of a modern electric-weld pipe mill desired to normalize the pipe after welding to improve physical properties and to make the product suitable for the oil industry requirements. Extensive, thorough tests enabled us to prove that short-cycle normalizing would produce the desired properties, and therefore a continuous furnace line could be considered practical and was installed. The furnace line heats the same pipe further to 1800° F., the temperature required for the following in-line stretchmill.

This one continuous production line therefore starts with plate, and in a straight, uninterrupted flow forms, welds and normalizes pipe and, if desired, stretch-reduces the pipe to various smaller sizes. This is a unique, automatic plant and installation and requires the minimum of man-power during operation.

The normalizing furnace line only, in that particular plant, showed a fuel cost of 39c per ton. Production amounts to 90 tons per hr., which, at that stage of processing, can safely be valued at approximately $100 per ton, or $9000 per hr., or $72,000 per turn. Less than 40 hr. of production, or of forced shutdown, represents the cost of the continuous furnace. The fuel cost for heat treatment is 4/10 of 1% of product value. Scale is of no consequence, as evidenced by the direct run into the reducing mill. Uniformity of treatment for every foot of pipe is assured because of continuous passage through identical heat and furnace conditions. Most important, however, short-cycle normalizing blends or heat treats the weld and the steel structure into a product of uniform physical properties, and thereby makes continuous processing possible.

The future can teach us much, concluded Mr. Hess, if we approach it with an open-minded desire to investigate heat processing instead of heating only, with a recognition of progress in quality and controls by continuous processing, and with a willingness to thoroughly and truly evaluate continuous heat processing equipment by its actual over-all performance and contributions.—**Reported by N. J. Petrella for Philadelphia Chapter.**

Metallurgical News and Developments

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Devoted to News in the Metals Field of Special Interest to Students and Others

Produce Rare Earth Metal—Dysprosium metal, one of the rare earths, is being produced by Nuclear Corp. of America in commercial quantities. Available only in tiny quantities before, the metal will find applications in the construction of nuclear reactors, in magnetic alloys for use in electronic devices, and in other fields to be determined by research. The dysprosium being produced is 98-99% pure, in lump and ingot form, in gram up to pound lots.

To Hold Course—An advanced short course in "Quality Control by Statistical Methods" will be held at Purdue University from June 10 to 20. Course will cover significance tests and estimation, linear and multiple correlation and regression, single and sequential sampling for measurements and analysis of variance. Information from Prof. Irving W. Burr, Statistical Laboratory, Purdue University, Lafayette, Ind.

Australians to Meet—The 11th Annual Meeting and Conference of the Australian Institute of Metals is to be held in Melbourne from May 26 to May 30. The Conference will concentrate on research developments.

Mechanical Congress—The 7th International Mechanical Engineering Congress, organized by Vereniging van Metaal-Industrieen, will be held at The Hague, Netherlands, from June 2 through June 6, 1958.

Expanded Metals — Designers Metal Corp., Harvey, Ill., has perfected tool designs making possible the manufacture on a production basis of hundreds of expanded metal patterns. This great variety of design and types of metal makes it possible to offer exclusive patterns for application to a particular product in a special industry.

New Toolsteel—Crucible Steel Co. of America has developed a new toolsteel, LaBelle HT, to answer growing demand in the tool and die industry for an improved shock steel with high toughness at high hardness levels.

Extruded Shapes—The first successful cold extrusion of hollow titanium shapes was reported recently by Battelle Memorial Institute for the Air Force.

New Plant—E. F. Houghton & Co. has completed a new plant and laboratory facilities in Detroit which more than doubles the original plant size.

Certificate Course—Western Michigan University, Kalamazoo, has inaugurated a two-year certificate course in "Foundry Technology". Information from the Industrial Technology Dept.

New Pig—A special aluminum pig for deoxidizing steel, particularly suited for applications requiring a minimum of heavy metal impurities, has been announced by Kaiser Aluminum & Chemical Sales, Inc. The special deoxidizing pig contains a minimum aluminum content of 98% with approximately 1.5-2% iron.

Study Welding—A research program to determine the value of ultrasonic welding as a technique for both spot and seam welding high-temperature alloys used in modern aircraft is being conducted for the Air Force at Battelle Memorial Institute.

Contest Announced—The Resistance Welder Manufacturer's Assoc., 1900 Arch St., Philadelphia 3, Pa., will sponsor a contest to give interested persons an opportunity to publicize their work, development and research in the field of resistance welding. $2000 in prizes will be awarded for winning papers in the special projection welding or general resistance welding classification. Contest closes Sept. 15; applications should be received by July 1.

Summer Courses—M.I.T. will hold special summer courses on the "Metallurgical Applications of X-Ray Diffraction", from Aug. 18 through Aug. 29, and on the "Casting of Light Metals" from June 17 through June 21. Write to M.I.T. for course outlines and details of attendance.

Foamed Metal—In a program aimed at finding whether it is possible to make metal foams that are better than plastic foams, Wright Air Development Center has developed foamed metal for sandwich-construction cores. Foam with 1/16 in. cells and density of 15 psi. was made by melting base alloy of 95% Al, 5% Mg, adding foaming agent (2% zirconium oxide), releasing hydrogen from hydride and solidifying foamed metal.

To Hold Institute—The second annual Infrared Spectroscopy Institute, to be held at Canisius College, Buffalo, N. Y., from Aug. 25-29, will cover elementary and advanced theory of infrared spectroscopy, its industrial applications and its future in research and industry.

Molding Process—Swayne, Robinson & Co., Richmond, Ind., has announced development of a molding process, called Azcast, aimed at production of precision castings. The method uses the CO_2 method of curing sand to produce castings which will hold ±.00015 dimensions. Molds are hardened on the patterns before the draw, providing close fit to casting surface. Best application will be to jobs which require close tolerances for machining.

Firms Licensed—Four European firms have been licensed by Upton Electric Furnace Co., Inc., Mount Clemens, Mich., during the past few months to manufacture and market Upton electric salt bath furnaces. They are: Electric Resistance Furnace Co., Ltd., Weybridge, England; Ing. F. Ferre & Co., Milan, Italy; Meci, of Paris; and Industrieofenbau Fulmina, Edingen-Mannheim, Germany.

Plastics for Autos—Cold rolled steel sheets, clad with a layer of vinyl plastic, are providing new and startling glamor to the interior of several 1958 automobiles. It can be produced in a wide variety of prints, textures and colors, combines the strength of steel with the chemical resistance of vinyl and is cigarette-burn, stain and scratch-proof. Shwayder Brothers, Inc., Detroit, is producing this vinyl-clad steel on Jones & Laughlin Steel Corp.'s 22-gage cold rolled sheet.

The 13th Metallographic Exhibit

Cleveland, Ohio, October 27 to 31, 1958

All metallographers—
everywhere—
are cordially invited to
display their best work.

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints should be mounted on stiff cardboard, extending no more than 3 in. beyond edge of print in any direction; maximum dimensions 14 by 18 in. (35 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the *face of the mount* giving:

Classification of entry.

Material, etchant, magnification.

Any special information as desired.

The name, company affiliation and postal address of the exhibitor should be placed on the *back of the mount* together with a request for return of the exhibit if so desired.

Entrants living outside the United States should send their micros by first-class letter mail endorsed "Photo for Exhibition—May be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 15, 1958, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
7301 Euclid Ave.
Cleveland 3, Ohio, U.S.A.

CLASSIFICATION OF MICROS

Class 1. Cast irons and steels.
Class 2. Carbon and alloy steels (wrought).
Class 3. Stainless steels and heat resisting alloys.
Class 4. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 5. Copper, nickel, zinc, lead and their alloys.
Class 6. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 7. Metals and alloys not otherwise classified.
Class 8. Series showing transitions or changes during processing.
Class 9. Welds and other joining methods.
Class 10. Surface coatings and surface phenomena.
Class 11. Slags, inclusions, refractories, cermets and aggregates.
Class 12. Electron micrographs.
Class 13. Results by unconventional techniques.
Class 14. Color prints in any of the above classes. (No transparencies accepted.)

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which in the opinion of the judges closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $500 from the Adolph I. Buehler Endowment will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All prize-winning photographs will be retained by the Society for one year and placed in a traveling exhibit to the various Chapters.

40th NATIONAL METAL CONGRESS & EXPOSITION

CLEVELAND PUBLIC AUDITORIUM — — — OCTOBER 27 THRU 31, 1958

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research,
Western Reserve University, Cleveland,
With the Cooperation of the John Crerar Library, Chicago.

General Metallurgy

214-A. Power Layouts in Steel Mills. A. J. Mosso. *Iron and Steel Engineer*, v. 35, Feb. 1958, p. 111-122.

In designing a satisfactory power layout, a balance must be maintained between cost and reliability. Planning should attempt to reduce maintenance problems, insure personnel safety, and provide access to components. (A5, W11; ST)

215-A.* Is Radiation Safety a Consideration in Working Magnesium-Thorium Alloys? Larry Silverstein. *Magnesium*, Feb. 1958, p. 1-6.

External radiation is not a serious problem; melting and chemical milling may require local exhaust ventilation. Welding presents a hazard unless local exhaust of vapors is used. (A7r; Mg, *Th*)

216-A. Science for Electroplaters. Pt. 34. Cyanide Removal by Ion Exchange. L. Serota. *Metal Finishing*, v. 56, Mar. 1958, p. 72-75.
(A8b, L17)

217-A. Are Metallurgists Prepared for 19XX? R. F. Thomson. *Metal Progress*, v. 73, Mar. 1958, p. 99-106.

The 15th annual William Park Woodside Lecture before the Detroit Chapter A.S.M. While the forseeable problems concerning metallic materials appear formidable in the extreme, the metallurgist has never before had so many good tools to attack them, and there appears no reasons to anticipate anything but success. (A-general, A9)

218-A. Roundup of Ductile Iron Technology. David Matter. *Modern Castings*, v. 33, Mar. 1958, p. 24-27.
(A-general; CI-r)

219-A. (French.) Boron Steels. A. Clerc. *Metaux Corrosion Industries*, v. 32, Nov. 1957, p. 409-435.

New improvements in quantitative determination; fabrication of low-alloy boron steels; Cr-Mo-Ti-B and other heat resistant steels; soldering and tempering characteristics; transformations. 65 ref. (A-general; AY, B, *Cr, Mo, Ti*, SGA-h)

220-A. (French-German.) Statistics and Nonferrous Metals. J. P. Pfeiffer. *Pro-Metal*, v. 10, Dec. 1957, p. 906-910.

Types of statistics and their usefulness; some American and European statistical publications in nonferrous field. (A4; EG-a38)

221-A. (German.) Containers and Tubes From Stainless Steel. P. Schierhold. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 1-6.

A survey of the most important contemporary stainless steels and their properties; use for containers and tubes.
(A-general, W12c, 17-57; SS, 4-60)

222-A. (German.) Bessemer Steels. Alfred Krüger. *VDI Zeitschrift*, v. 99, Nov. 11, 1957, p. 1604-1610.

Production methods, types, properties and application fields.
(A-general, D-general; ST-g)

223-A. (Russian.) Research on Heat Resistant Steels. A. V. Stanyukovich. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 26-30.
(A-general, A9m; SS, SGA-h)

224-A. Wastes Yield Enriched Uranium. *Chemical and Engineering News*, v. 36, Apr. 14, 1958, p. 50, 52.

Goodyear Atomic recovers valuable U^{235} and U^{238} from decontamination and laboratory waste solutions. (A8b, C19a; U)

225-A. Classification Scheme for Corrosion Topics. D. M. Brasher. *Corrosion Prevention and Control*, v. 5, Feb. 1958, p. 39-42.

Scheme developed by the Corrosion Group, Chemical Research Laboratory, Teddington, England, is based on the Abstract Filing Index of the National Association of Corrosion Engineers (U. S. A.).
(A14d, R-general)

226-A. Copper and Copper Alloys. A Survey of Technical Progress During 1957. E. Voce. *Metallurgia*, v. 57, Jan. 1958, p. 3-15.
309 ref. (A-general; Cu)

227-A.* Production and Properties of Super-Purity Aluminum. T. G. Pearson and H. W. L. Phillips. *Metallurgical Reviews*, v. 2, 1957, p. 305-360.

Production, analysis for minor impurities, determination of a wide range of physical, electrical and chemical properties, recrystallization behavior, fabrication and joining of 99.98% pure Al. 178 ref.
(A-general; Al-a)

228-A. Cup and Saucer Effect. The Case for Improved Steel Inventory Control. F. R. Palmer. *Steel Processing and Conversion*, v. 44, Mar. 1958, p. 137-139, 164-165.
(A5e; ST)

229-A. (Czech.) Treatment of Waste Water in the Metallurgical Industry. Eugen Zamrzla. *Hutnické Listy*, v. 13, Feb. 1958, p. 133-140.
16 ref. (A8b)

230-A. (German.) 100 Years of Open-hearth Furnace Practice. Franz Sommer. *Giesserei*, v. 45, Feb. 27, 1958, p. 117-122.
15 ref. (A2, D2; ST)

231-A. (German.) Manufacturing of Bright Steel. Herbert Muller. *Industrie-Anzeiger*, v. 79, Oct. 11, 1957, p. 1237-1239.

Manufacturing methods and technical properties.
(A-general, D-general, G18; ST)

232-A. (German.) Electrochemical Waste Water. K. Volz. *Metalloberfläche*, v. 12, Jan. 1958, p. 1-4.

Decontamination and disposal after plating and galvanic processes.
(A8b, L17)

233-A. (German.) Cost Calculation for Building and Management of Waste Water Disposal System According to Degussa Process. E. Asendorf. *Metalloberfläche*, v. 12, Jan. 1958, p. 6-8.
(A8b, L17)

234-A. (German.) Decontamination and Neutralization of Waste Water. K. H. Hartung. *Metalloberfläche*, v. 12, Jan. 1958, p. 17-21.
(A8b, L17)

235-A. (German.) System Decontamination of Electroplating Waste Water. P. Douwenga. *Metalloberfläche*, v. 12, Jan. 1958, p. 22-26.
(A8b, L17)

236-A. (German.) Future Metal Resources. Ferdinand Friedensburg. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Dec. 1957, p. 573-576.

Estimates of total amounts of ores; effects of higher prices and improved extraction techniques.
(A4, A11a, RM-n)

237-A. (German.) Present and Future U. S. Mineral Resources. Elmer W. Pehrson. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Dec. 1957, p. 577-584.
(A4; 14-59, NM-e)

238-A. (German.) Development of Titanium Metallurgy. Helmut Winterhager. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Dec. 1957, p. 585-592.
12 ref. (A-general, Ti)

239-A. Effluent Problems. F. Wild. *Metal Industry*, v. 92, Jan. 24, 1958, p. 69-71; Feb. 7, 1958, p. 111-113.
(A8b, L17)

240-A. (Book.) Stainless Steel Fabrication. 386 p. 1957. Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.
Guide to selection and application.
(A-general; SS)

241-A. (Book.) A Symposium on Uranium and Uranium Dioxide. Nuclear Metallurgy, v. 4, 1957. IMD. Special Report Series AIME, 143 p. American Institute of Mining, Metallurgical, and Petroleum Engineers, 29 W. 39th St., New York 18, N. Y.
Melting, casting, forging, rolling,

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full within the next few months.

cold working and welding of uranium. Preparation and fabrication of uranium dioxide for fuel elements. Papers abstracted separately.
(A-general, T11g; U)

242-A. (Book.) Russian-English Glossary of Solid State Physics. I. Emin, editor. 90 p. 1958. Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y. $10.

Includes over 4000 Russian terms and their English equivalents from solid state theory, crystallography, metallurgy, ferromagnetism, physics of metals and semiconductors.
(A-general, 11-67)

243-A. (Book.) Magnesium in Perspective. Proceedings, 13th Annual Convention. 1605 p. Oct. 1957. Magnesium Association, 122 E. 42nd St., New York 17, N. Y.

Papers abstracted separately.
(A-general; Mg)

244-A. (Book.) National Symposium on Vacuum Technology Transactions. E. S. Perry and J. H. Durant, editors. 256 p. 1957. Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y. $10.

Vacuum techniques in extraction, refining, melting, casting and research. (A-general, C5m, C25, D8m, R1h; 1-73)

B Ore and Raw Material Preparation

84-B. Upgrading Iron Ore by Fluidized Magnetic Conversion. Robert J. Priestly. *Blast Furnace and Steel Plant*, v. 46, Mar. 1958, p. 303-306.

(B15q; Fe)

85-B.* New Process Reduces Iron Ores With Carbon Monoxide. P. M. Unterweiser. *Iron Age*, v. 181, Jan. 30, 1958, p. 93-95.

The Stelling process, a Swedish development, utilizes carbon monoxide at atmospheric pressures, temperatures of about 1100° F. and a fluidized ore bed for the reduction of iron ore. The product formed is iron carbide. Process has been checked on pilot plant scale.
(B15q; Fe)

86-B. (French.) Differential Flotation of Lead-Zinc Ores. A Suggested Classification of Ores and Flotation Techniques. M. Rey. *Revue de l'Industrie Minerale*, v. 40, Jan. 1958, p. 65-74.

10 ref. (B14h; Pb, Zn)

87-B. (Portugese.) Developments in the Sintering of Lead and Zinc Ores in Dwight-Lloyd Furnaces. Tharcisio D. de Souza Santos. *ABM, Boletim da Associacao Brasileira de Metais*, v. 13, Oct. 1957, p. 349-363.

14 ref. (B16a, W15a; Pb, Zn)

88-B.* (Slovenian.) Chemistry of Roasting Arsenic and Antimony Trisulphides and Cobalt and Nickel Sulphides, as Well as Their Binary Mixtures. Krsto Cazafura. *Rudarsko-Metalurski Zbornik*, no. 4, 1957, p. 345-359.

Thermal and chemical analysis data explain the products obtained by roasting the sulphides at characteristic temperatures. The oxidation process may be divided into two phases—reactions which occur between sulphide and oxygen, and reactions between the products of the first phase and the unchanged sulphide on contact surfaces. Purpose of the tests is the production of Ni and Co from their sulphide concentrates which contain arsenic and antimony sulphides. 18 ref.
(B15, P12; Ni, Co)

89-B. Minerals Beneficiation in 1957. *Mining Engineering*, v. 10, no. 2, Feb. 1958, p. 244-252.

(B12, B13, B14)

90-B. (German.) Limits and Possibilities of Modern Preparation Techniques. Helmut Kirchberg. *Neue Hütte*, v. 3, Jan. 1958, p. 1-9.

Magnetic separation and flotation of low-grade siliceous ores; progress in concentration by flotation.
(B14)

C Extraction and Refining

122-C. Second Look at Hot Salts. What Happens When a Metal Dissolves in Its Own Molten Halide? *Chemical and Engineering News*, v. 36, Mar. 24, 1958, p. 34.

(C1p; Ni, Co)

123-C. Preparation of Bismuth for Use in a Liquid-Metal Fueled Reactor. G. W. Horsley. *Journal of Nuclear Energy*, v. 6, no. 1-2, 1957, p. 41-52.

Analysis of pile neutron capture cross-section (38-39 m barns) of samples of commercial refined Bi indicate that chlorine is the most deleterious impurity. Study of bismuth-oxygen-chlorine system suggests that concentration of this element may be reduced to about 13 ppm. by oxidation and filtration, the residual chlorine remaining in solution as bismuth oxychloride. 9 ref.
(C28j, P18j, T11g, 17-57; Bi)

124-C.* Titanium Technology. Pt. 1. R. L. Jaffee. *Modern Metals*, v. 14, Feb. 1958, p. 46-54.

Production methods, ore reserves, melting and casting. Problems involved in re-using scrap.
(C-general, A11a, A11d; Ti)

125-C. Melting and Casting of Uranium. N. D. Baines and E. Mason. *United Kingdom Atomic Energy Authority*, IGR.TN/C.710, Dec. 1957, 7 p.

Investigations into the production of homogeneous casts in respect to grain size and composition, casting to size, assessment of factors likely to influence grain size (including effect of ultrasonics on solidification) and prevention of contamination during melting. (C5, 1-74; U)

126-C. Concurrent Vacuum Distillation Between Crucible Tungsten and Charge. L. E. Preuss. Paper from *"1956 National Symposium on Vacuum Technology"*, p. 127-146.

Investigation of the differential evaporation between W crucible material and Au and Cr distilland described for the empirical conditions of vacuum distillation. 31 ref.
(C22, 1-73, W18h)

127-C. A Study of Melting and Refining Molybdenum and Columbium by the Vacuum Arc Cast Process. E. D. Sayre and A. J. Stoph. Paper from *"1956 National Symposium on Vacuum Technology"*, p. 175-181.

(C25; Cb, Mo)

128-C. Vaccum Induction Melting. James H. Moore. Paper from *"1956 National Symposium on Vacuum Technology"*, p. 202-208.

5 ref. (C5j, D6, 1-73)

129-C. Thermodynamics of the Vacuum-Induction Melting Process. W. J. Pennington. Paper from *"1956 National Symposium on Vacuum Technology"*, p. 209-214.

6 ref. (C5j, D6, 1-73, P12)

130-C. Industrial Metallurgical Application of High-Vacuum for Extraction of Hydrogen From Titanium in the Solid State. F. A. Fazzalari. Paper from *"1956 Symposium on Vacuum Technology"*, p. 215-221.

6 ref. (C25, C5m; Ti, *H*)

131-C.* Uranium Ingot Production at Atomic Energy Commission Feed Material Production Centers. B. J. Buntz. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 17-21.

Reduction of uranium tetrafluoride to metal and melting and casting of ingots by means of vacuum induction furnace with graphite crucibles and molds.
(C1p, C5j, 1-73; U, 5-5g)

132-C.* Melting and Casting of Uranium, Zirconium, Niobium Alloys. J. E. Baird and N. J. Carson. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 31-37.

Vacuum induction melting and casting of uranium alloys containing 5% Zr and 1.5% Cb, into cores for nuclear reactor fuel elements. Ingot soundness, mold design and melting practice. (C5j, 1-73, T11g; U, *Zr, Cb*)

133-C.* Arc Melting of Uranium-Rich Alloys. W. H. Britton and W. B. Haynes. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 63-66.

Major problems in application of arc melting technique to U-Mo and U-Cb alloys include control of macrosegregation and removal of contaminants. Notes limited production use and suggests possible future developments. 4 ref. (C5h; U, *Mo, Cb*)

134-C.* Various Methods of Preparing Uranium Dioxide for Fuel Element Use. C. M. Henderson, G. W. Tompkin and D. E. Rhodes. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 123-130.

Numerous chemical methods. Production of uranium dioxide from uranium hexafluoride. Effect of various physical treatments applied to uranium dioxide powders on particle size and density of sintered compacts.
(C19, C1p, H-general, T11g; U, 14-68)

135-C.* (Portuguese.) Direct Electrolytic Refining of Black Copper. Ivo Jordan. *ABM, Boletim da Associacao Brasileira de Metais*, v. 13, Oct. 1957, p. 287-318.

Electrolytic refining of Cu with anodes of black Cu produced by direct fusion in water-jacketed furnace, without recourse to intermediate treatment in anode furnace. Deposits of 99.99% pure Cu were obtained on starting sheets of electrolytic Cu formed by electrodeposition on stainless steel. Experiments were conducted on laboratory scale with electrodes of various compositions. Effect of voltage between electrodes, cathodic current output, characteristics of cathodes produced and of anodic slime. 8 ref. (C23p; Cu)

136-C. (Romanian.) Contribution to the Study of the Electrolytic Refining of Phosphorus-Nickel Alloys. I. Atanasiu, A. Calasaru and Mira Popescu. *Revista de Chimie*, v. 9, Jan. 1958, p. 8-13.

(C23p; Ni, *P*)

137-C.* Continuous Rod and Tube Casting. *Metalworking Production*, Dec. 27, 1957, p. 2303-2309.

The Solicast process for continuous casting of phosphor bronze and steel rod and tube. Longer rods with uniform hardness can be produced.
(C5q; Cu-s, ST, 4-55, 4-60)

138-C. (Czech.) Preparation of Zirconium by Reduction of Zirconium Tetrachloride and by Electrolysis of Potassium Zirconium Fluoride. Frantisek Pizak and Vaclav Klabik. *Hut-*

(*)Articles Available Through Photocopy Service; See Coupon, p. 6

nické Listy, v. 13, Jan. 1958, p. 26-33. 12 ref. (C23, C22j; Zr)

139-C.* (German.) **Refining of Aluminum Melts.** H. Riedelbauch. *Aluminium*, v. 34, Mar. 1958, p. 130-134.

Chlorine and nitrogen refining are effective, convenient and trouble-free if the proposed gases are replaced by salt mixtures of equivalent activity. Theory and methods of grain refining. 19 ref. (C21; Al)

140-C. (Hungarian.) **Developments in Magnesium Metallurgy.** Andor Szulyovszky. *Kohaszati Lapok*, v. 12, Jan-Feb. 1958, p. 66-70.

In countries having dolomite as a source of Mg, thermal process is more efficient and economical than electrolytic process. Thermal process is reduction of magnesium oxide at high temperature with an agent having greater chemical affinity for oxygen than Mg, such as carbon, silicon and calcium carbide. 4 ref. (C23, C26, Mg; *C, Si, Ca*)

141-C. Alloys From Oxides. Nicholas Martini. *Chemical and Engineering News*, v. 30, Apr. 21, 1958, p. 59-60.

Induction furnace process for Mo, Ti, Hf, Cb, Ta, Cr and W. (C21d, 1-69; Mo, Ti, Hf, Cb, Ta, Cr, W)

142-C. Process Refines Nickel. *Chemical and Engineering News*, v. 36, Apr. 21, 1958, p. 60.

Direct electrolysis of Ni matte. (C23n; Ni)

143-C. Processing Monazite. John Barghusen. *Chemical and Engineering News*, v. 36, Apr. 21, 1958, p. 61-62.

Process for obtaining uranium-free Th at a reasonable cost. (C19n; Th, Ce, EG-g)

144-C.* Vacuum Melted High-Temperature Alloys. *Metal Industry*, v. 92, no. 4, Jan. 24, 1958, p. 63-66.

New processing technique has permitted increased operating temperatures in jet engines by its effect on high-temperature strength and ductility. Chemical composition and heat treatments for J-1570, GMR-235, Udimet 500, M-252 and Waspaloy. Tensile and stress-rupture tests; effect of B and Zr additions on rupture life. (C25, Q27, Q3; SGA-h)

145-C. Vacuum Melted Metals. *Metal Industry*, v. 92, Jan. 31, 1958, p. 95-96.

Production of Ti, Zr and their alloys. (C25, Ti, Zr)

146-C. Mechanism of Formation of Zirconium Sponge in the Magnesiothermal Production of Zirconium. F. G. Reshetnikov and E. N. Oblomeev. *Atomnaya Energiya*, v. 3, 1957, no. 5, p. 459-462. (Henry Brutcher, Altadena, Calif., Translation no. 4055.)

Previously abstracted from original. See item 202-C, 1957. (C26; Zr, 6-74)

147-C. (French.) **Electrolytic Separation of Hafnium and Zirconium by Means of Fused Salts.** G. Chauvin, H. Coriou and J. Huré. *Métaux-Corrosion-Industries*, v. 23, Dec. 1957, p. 469-474.

Melting of NaCl (65%) and K_2ZrF_6 (35%) at 850° C. and electrolytic separation of Hf and Zr in an argon atmosphere. 6 ref. (C23p; Hf, Zr)

148-C.* (German.) **Industrial Experiments in the Production of Oxygen-Free Copper.** Hans Eckstein. *Neue Hütte*, v. 3, Jan. 1958, p. 32-36.

Causes of gases in electrolytic and refined Cu. Deoxidation must be performed at the same time as dehydration; deoxidizing agents. Method using charcoal filter and nitrogen as protective gas can produce Cu with oxygen content below 0.0003% and specific weight of 8.7. Another process gives oxygen-free Cu with oxygen content of 0.0002% and specific weight of 8.9. (C23; Cu-a)

D Iron and Steelmaking

129-D. European Steelmaking Today. Alastair McLeod. *Iron and Steel Engineer*, v. 35, Feb. 1958, p. 133-159. 52 ref. (D-general, A4, A9; ST)

130-D.* Use of Fusite in Desulphurizing Off-Grade Pig Iron. J. Goswami, A. B. Chatterjea and B. R. Nijhawan. *Journal of Scientific and Industrial Research*, v. 16A, Nov. 1957, p. 522-526.

Off-grade pig iron desulphurized with fusite (sodium carbonate) in acid and basic-lined ladles. Desulphurizing in acid-lined ladles was erratic due to the interaction of iron and/or manganese sulphide from the acid lining. The efficiency of desulphurization in basic-lined ladles determined by the initial sulphur content. Effect of desulphurization on mechanical properties. 11 ref. (D9m, D11n; CI-a)

131-D. (German.) **Bessemer Converter; 100 Years Ago and Today.** Hans Erdelen-Dellingsen. *Giesserei-Praxis*, no. 1, Jan. 10, 1958, p. 9-11. (D3, W18p, A2)

132-D. (German.) **Investigation of Metallurgical Processes by Means of Slag Isolation.** C. A. Muller and E. Plockinger. *Radex Rundschau*, no. 5-6, 1957, p. 738-753.

Deoxidation was studied in open-hearth and electric furnaces as well as the bessemer converter. 16 ref. (D11r; ST, RM-q)

133-D. (German.) **Investigation of Deoxidation of High-Carbon Openhearth Steels With Ferrosilicon, Aluminum and Calcium-Silicon.** E. Plockinger and A. Randak. *Radex Rundschau*, no. 5-6, 1957, p. 754-768.

11 ref. (D11r; ST-e, AD-r, *Al, Ca, Mn, Si*)

134-D.* (Italian.) **Carbon and Sulphur Reactions and Metal-Slag Equilibrium in the Refining of Steel With Oxidizing Slag.** G. Violi. *Metallurgia Italiana*, v. 49, Dec. 1957, p. 805-816.

Oxygen content of steel and carbon-oxygen equilibrium; mechanism and kinetics of decarburizing reaction; metal-slag equilibrium and control of decarburizing reaction; elimination of sulphur; carbon-oxygen equilibrium and sulphur distribution. Study of reactions in basic electric furnace. 23 ref. (D11n, D5; ST)

135-D. (Japanese.) **Operation of a 1-Ton Testing Blast Furnace.** Kuro Kanamori. *University of Tokyo, Institute of Industrial Science, Report*, v. 6, Sept. 1957, p. 285-352.

Bessemerizing, desulphurizing and removal of Cr. 7 ref. (D1b, D11n, W17g; ST, *Cr, S*)

136-D. Production of Low-Phosphorus Foundry Iron From High-Phosphorus Iron Ores. R. L. Higgins and J. C. Billington. *British Cast Iron Research Association, Journal of Research and Development*, v. 7, Feb. 1958, p. 171-187.

The oxygen top blowing process in a stationary vessel was examined to determine possibility of obtaining dephosphorization without substantially affecting the carbon content of the iron. Emphasis placed on removal of phosphorus, rather than retention of carbon; necessity for extensive recarburization of the dephorized metal. Dephosphorization and recarburization can be carried out in the Kaldo converter with comparatively little phosphorus reversion. There may be several advantages in carrying out the recarburization treatment in a separate unfired vessel. 9 ref. (D10b; CI-a, *P*)

137-D. Direct Reduction Process Is Home. *Chemical and Engineering News*, v. 36, Apr. 14, 1958, p. 48.

Strategic Udy process to make iron from iron ore passes prototype test; characteristics itemized. (D8j; Fe)

138-D. Fast Scrap-Charging Boosts Openhearth Output. G. J. McManus. *Iron Age*, v. 181, Mar. 20, 1958, p. 110-111.

(D2a; RM-p, ST)

139-D. Mold Design for Continuous Casting of Steel. G. I. Kozlitin and L. N. Kolyibalov. *Iron and Coal Trades Review*, v. 176, Jan. 3, 1958, p. 31-33. (From *Stal*, no. 3, 1957, p. 209-213.)

Previously abstracted from original. See item 228-D, 1957. (D9q, W19c, 1-52; ST)

140-D.* (Czech.) **Influence of Metallurgical Process on the Watt Losses of Transformer Sheets.** J. Skala, M. Knotek and R. Vokac. *Hutnické Listy*, v. 13, Jan. 1958, p. 14-21.

With suitable modification of the steel production method involving reladling, standing for 15 min. in the ladle and preliminary deoxidation with 1 kg. Al per ton, watt losses can be decreased 0.07 w. per kg. Effect of position in the ingot and influence of melting silicon content in the melt has the most important effect. 6 ref. (D9m, P15; ST, SGA-n)

141-D.* (French.) **Chromium and Ferrochromium for Alloy Steels.** Ch. Dingeon. *Revue de Metallurgie*, v. 55, Jan. 1958, p. 1-8.

Reduction and refining techniques and equipment; metallurgical reactions involved; properties imparted to steels by alloying with Cr. (D9r; AY, AD-n, *Cr*)

142-D.* (French.) **New IRSID Process for Refining Irons Containing Phosphorus, Using Pure Oxygen and Lime Powder.** B. Trentini and M. Allard. *Revue de Metallurgie*, v. 55, Jan. 1958, p. 67-74.

New patented process for basic bessemer steels in particular, characterized by complete change in behavior of oxygen jet striking surface of bath, a modification brought about by precise control and regulation of a suspension of finely divided lime carried by the oxygen and used in concentrations varying with nature of iron and given phase of operation. Si content of iron may vary over a wide range, dephosphorization can be advanced with respect to decarburization, and very low phosphorus content can be attained if killed, mild, medium or high-carbon steels are required. 13 ref. (D3f, 1-65; ST)

143-D.* (French.) **Hydrodynamic and Practical Study of Movement of the Bath in a Bottom-Blow Converter. Pt. 1.** P. Leroy and G. Cohen de Lara. *Revue de Metallurgie*, v. 55, Jan. 1958, p. 75-97.

Systematic examination of geometrical and pneumatic factors influencing "blowability". General interpretation of hydrodynamic phenomena, including physical theory of mass oscillations of bath contained in converter, and some prac-

tical conclusions regarding design of bessemer and basic bessemer plants. Primary design requirement for bottom-blown furnaces is as wide a blast zone as possible; hence peripheral blast orifices should be as close as possible to inner boundaries of lining. (To be continued.)
(D3b; ST)

144-D. (German.) **Effect of Electro-Inductive Agitation of the Bath on Metallurgical Reactions in the Electric Arc Furnace.** Karl Georg Speith, Hans vom Ende and Wolfgang Schneider-Milo. *Stahl und Eisen*, v. 78, Feb. 20, 1958, p. 215-220.
15 ref. (D5f)

145-D.* (German.) **Basic Hot Blast Cupola, Openhearth Steel Plant and the L-D Crucible Combined in One Unit.** Adolf Richter, Georg Cohnen and Paul Jacobi. *Stahl und Eisen*, v. 78, Mar. 6, 1958, p. 273-284.

The hot blast cupola is used as a premelting plant for the electric arc furnace with intermittent use of a Linz-Donawitz crucible for special steels. Gas cleaning plant consists of two washers. Capacity of the hot blast cupola is 15 tons per hr.; efficiency with different proportions of openhearth pig iron in the charge. Charging openhearth furnace with molten pig iron; comparisons with and without addition of ore (10-20%). L-D crucible consumes 52 cu.m. per ton 99% oxygen. Construction details, lining wear, operation sequence and time consumption.
(D2, D10a, 1-65; ST)

146-D.* (German.) **Decarburizing Reaction in the Basic Steel Converter During Dephosphorization.** Heinz Pottgiesser. *Stahl und Eisen*, v. 78, Mar. 6, 1958, p. 291-298.

Calculation of adjustment of carbon and oxygen when blowing with air, oxygen-enriched, and mixtures of oxygen and carbonic acid; relation between carbon and nitrogen content in the blown iron; iron content in slag and manganese content in the metal; their relation to the carbon content of the steel bath. 10 ref. (D3, 1-65; ST)

147-D.* (Japanese.) **Effect of Vacuum Melting on Nature of Cast Iron Melt.** Tadao Sato, Tosjio Hirooka and Hideo Teramura. *Casting Institute of Japan, Journal*, v. 29, Nov. 1957, p. 764-771.

Vacuum melting of Fe-C alloys of hypo and hypereutectic compositions showed decrease in C and S content and increase in Si and P. Oxygen and nitrogen decreased to about 5 ppm. Most common microstructure was fine eutectic graphite in pearlitic and ferritic matrix and carbide network in the boundary of eutectic cells. Microstructure depends on melting temperature, carbon content and/or degree of evacuation. 6 ref.
(D8m, E10, 1-73; ST, CI)

148-D.* (Czech.) **Prerefining of Basic Bessemer Pig Iron With Oxygen.** Ludek Kodrle. *Hutnické Listy*, v. 12, no. 12, 1957, p. 1070-1077.

Prerefining found to be economic under some conditions for iron containing a wide range of Mn and Si. Temperature increase in relation to specific consumption of oxygen. Relationship between Si and Mn content and furnace loss of these elements. 19 ref. (D3f, 1-65; CI-a)

149-D. (German.) **Use and Economy Gained From Openhearth Furnace Automation in Industrial Practice.** Heinz Klepsch. *Neue Hütte*, v. 3, Jan. 1958, p. 20-26.

Automatic chamber adjustment; control of pressure and composition of furnace atmosphere. Advantages of automatic control include decrease in consumption of fuel; increase in furnace efficiency; higher stability of furnace materials and saving in fireproof roofs and linings; closer control of process; more constant operation of furnace.
(D2, W18r, 18-74)

150-D.* (German.) **Control of Openhearth Furnaces, Particularly in Case of Heating With Unpurified Producer Gas.** Gunther Oppelt. *Neue Hütte*, v. 3, Jan. 1958, p. 26-31.

Variables which can be controlled are air-gas mixture, furnace atmosphere pressure, reversing of regenerating chambers; oxygen content in waste gas as criterion of burning process; causes of disturbances in gas head and its influence on control system; automatic correlation between reversing frequency of chambers and thermal condition in furnace. (D2h; RM-m36)

151-D. (Russian.) **Refractories for Bottom of Openhearths.** I. V. Panyushkin and M. K. Musikhina. *Metallurg*, Dec. 1957, p. 20.

Improved slag results from the addition of magnesia to the dolomite refractory. (D2d, W18r; RM-h)

E Foundry

239-E. Precision Pressure Casting. *Australasian Manufacturer*, v. 42, Dec. 14, 1957, p. 44-46.
(E15, 3-74)

240-E. Swelling of Wood Patterns. Lars Lange. *Foundry Trade Journal*, v. 104, Feb. 13, 1958, p. 175-177.

Analysis of the mechanism of swelling and shrinkage. Consequences of such action and preventive measures. (E17, W19j)

241-E. Canadian Hot-Blast Water-Cooled Cupola. Pt. 2. J. E. Rehder. *Foundry Trade Journal*, v. 104, Feb. 13, 1958, p. 184-185.

Experience indicates that banking this furnace overnight is more economical than dropping the bottom each night, contrary to original expectations. (E10a, W18d)

242-E. Process Charts Applied to Foundry Operations. F. Gaiger. *Foundry Trade Journal*, v. 104, Feb. 20, 1958, p. 203-209.
(E-general, A5)

243-E.* An Instrument for Measuring the Gas Content of Aluminium Alloys During Melting and Casting. C. E. Ransley, D. E. J. Talbot and H. C. Barlow. *Institute of Metals, Journal*, v. 86, Jan. 1958, p. 212-219.

The parameter to be measured is the internal pressure of hydrogen in the melt. The instrument depends on the circulation of a small stream of nitrogen through the metal. The volume of gas circulated must be kept very small (2-3 cc. S.T.P.) and a special pump, valves and analysis Katharometer were developed. Probable use for other metals. 6 ref. (E5m, 1-53; Al)

244-E.* Molding Characteristics of Allahabad Sand. U. C. Sharma, R. M. Krishnan and B. R. Nijhawan. *Journal of Scientific and Industrial Research*, v. 16A, Nov. 1957, p. 517-522.

Sand tests included chemical analysis, mechanical grading, high-temperature tests and examination of molding properties. Molding characteristics of unwashed sand bonded with 5% Bihar bentonite and mixtures of washed sand with bentonite dextrine, Kordek, linseed oil and silica flour were evaluated.
(E18r, E19)

245-E. Molding Characteristics of Hardware Sand. B. V. Somayajulu and B. R. Nijhawan. *Journal of Scientific and Industrial Research*, v. 16A, Dec. 1957, p. 566-570.
(E18r, E19)

246-E. Stainless Castings With Unusual Hot Strength. Carl Tylka. *Materials in Design Engineering*, v. 47, Mar. 1958, p. 104-105.

Close control of solidification rate yields cast valves and fittings exceeding ASTM strength specifications. In large fittings, use of castings instead of forgings results in cost reduction of up to 40%.
(E25n, Q27a, 2-62; SS, 5-60)

247-E. Profitable Companions. Shell Cores and Green Sand Molds. Frank K. Shallenberger. *Modern Castings*, v. 33, Mar. 1958, p. 32-33.

The use of shell cores in conjunction with shell, permanent, or green sand molds offers substantial savings in material, labor and equipment. (E19a, E19c)

248-E. Good Practices With Better Refractories for Best Ladle Lining. J. H. Rickey, Jr. *Modern Castings*, v. 33, Mar. 1958, p. 35-38, 120-121.

Casting quality is greatly affected by ladle refractories.
(E23, W19b; RM-h)

249-E.* Risering of Gray Iron Castings. J. F. Wallace and E. B. Evans. *Modern Castings*, v. 33, Mar. 1958, p. 39-45.

A recommended procedure based on available data and original calculations. 35 ref. (E22q; CI-n)

250-E.* Some Structural Considerations in Nodular Iron. Verne Pulsifer. *Modern Castings*, v. 33, Mar. 1958, p. 46-48.

Solidification process; proposal that nodules form near the liquidus in a normal nucleation process rather than near or below the solidus. Studies of rapidly chilled shot support this thesis. Mechanism and structures resulting from formation of magnesium sulphide.
(E25q, N2; CI-r)

251-E.* Correlation of Green Strength, Dry Strength and Mold Hardness of Molding Sands. R. W. Heine, E. H. King and J. S. Schumacher. *Modern Castings*, v. 33, Mar. 1958, p. 49-58.

Experiments to correlate green and dry strength with mold hardness. Effects of moisture content and clay type and amount. (E18r, E19)

252-E.* Deoxidation Practice for Copper Shell-Molded Castings. R. C. Harris. *Modern Castings*, v. 33, Mar. 1958, p. 59-63.

Embrittlement of Cu shell-molded castings results from decomposition of the phenolic resin used in the shell mold, causing the "steam reaction". Of four deoxidizers examined, Ti and Li proved effective. Gas-fired and 20,000 cps. induction equipment were found suitable for melting pure Cu. 6 ref. (E16c, E10; Cu)

253-E.* Mold Surface Behavior. Dan Roberts and Earl E. Woodliff. *Modern Castings*, v. 33, Mar. 1958, p. 64-70.

A simple low-cost device to examine rate and amount of mold expansion during pouring. The effect of variables such as moisture content, clay content and grain distribution is predictable; thus expansion can be kept within allowable limits. (E19)

(*)Articles Available Through Photocopy Service; See Coupon, p. 62

254-E.* Evaluation of Shell Molding Process Capability. W. C. Truckenmiller, C. R. Baker and G. H. Bascom. *Modern Castings*, v. 33, Mar. 1958, p. 71-76.

Procedures, specific results and conclusions from investigations for the evaluation of dimensional control capabilities of the shell process. Sampling procedures for the development of critical pattern dimensions. (E16c)

255-E.* Induction Melting in a Magnesium Sand Foundry. J. G. House and M. E. Brooks. *Modern Castings*, v. 33, Mar. 1958, p. 77-80.

Melting in a line-frequency induction furnace. Various types of foundry scrap, as well as primary Mg, were melted and the operating characteristics compared with those of a gas-fired filter-type furnace. (E10r, W18a; Mg, RM-p)

256-E.* Investigation of the Hardening of Sodium Silicate Bonded Sand. Carl E. Wulff. *Modern Castings*, v. 33, Mar. 1958, p. 81-85.

Effects of CO_2, evaporation hardening, nitrogen, setting time, 3% binder, thermal hardening and temperature on the tensile strength of silica sand. 5 ref. (E18r)

257-E.* Fundamental Studies on Effects of Solution Treatment, Iron Content, and Chilling of Sand Cast Aluminum-Copper Alloy. E. M. Passmore, M. C. Flemings and H. F. Taylor. *Modern Castings*, v. 33, Mar. 1958, p. 86-93.

Solution treatment temperatures and times greater than those normally employed result in substantial improvement of mechanical properties of Al-Cu sand castings. Reduction of iron content below 0.24% also improved properties significantly. (E22r, J27a, Q-general, 2-60; Al, *Cu*)

258-E. High-Integrity Aluminum Castings. A. R. Mead. *Product Engineering*, v. 29, Feb. 17, 1958, p. 69-71.

(E-general, Q-general; Al)

259-E.* Development of Casting Techniques for Uranium and Uranium Alloys. George E. Jaynes, James M. Taub and Denton T. Doll. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 1-15.

Shapes ranging from 1 to 1800 kg. cast in vacuum induction furnaces with either micarta tube or steel tank construction. Use of graphite coated with ceramic as material for crucibles and molds. Application of uncooled induction coils, induction stirring and use of castable refractories, glass and copper as mold materials. (E10, 1-69, 1-73, 1-52, W19g; U)

260-E.* Centrifugal Casting of U-Zr Alloy Rods. Arthur B. Shuck. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 39-50.

Design, development and experimental evaluation of multiple mold centrifugal casting machine with precision copper molds used in connection with high-vacuum induction heated melting and pouring to produce fuel rods or slugs from uranium alloy with 2% Zr. 6 ref. (E14, E10, 1-69, 1-73, T11g; U, *Zr*)

261-E.* Induction Melting of Uranium Base Alloys. Neill J. Carson, Jr. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 23-29.

Vacuum induction melting, alloying and casting of uranium, U-Cb, U-Zr, U-Mo, U-Cr, U-Si and U-Al. Use of coated graphite and other materials as crucibles and molds. (E10, 1-69, 1-73, W18h, W19g; U)

262-E.* Injection Casting of Uranium-Fissium Alloy Pins. F. L. Yaggee, J. E. Ayer and H. F. Jelinek. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 51-62.

Injection casting apparatus. Mechanical and physical properties of pins cast from artificially formulated uranium-base fissium alloys. 4 ref. (E16, 1-52, Q-general, P-general, T11q; U)

263-E. (German.) **Production of Manganese Bronze.** F. Paschke. *Giesserei-Praxis*, no. 3, Feb. 10, 1958, p. 45-47.

(E-general; Cu-s, *Mn*)

264-E. (German.) **Slag Strainer Sprue and Its Benefits.** W. Pischl. *Giesserei-Praxis*, no. 3, Feb. 10, 1958, p. 48-50.

Construction of slag strainer sprue must be adapted to each type of casting. Its use results in reduction of inclusions by 35-40%. (E22; 9-69)

265-E. (German.) **Influence of Calcium-Silicon on the Casting of Steel.** Friedrich Lindenbeck. *Giesserei-Praxis*, no. 4, Feb. 25, 1958, p. 74-75.

(E25; ST, *Ca*, *Si*)

266-E. (Italian.) **Technical and Economic Factors Involved in the Production of Good Castings.** Giuseppe Barchiesi. *Fonderia*, v. 6, Dec. 1957, p. 517-523.

(E-general)

267-E.* (Italian.) **Cupola Melting of Bronzes.** Giuseppe Barchiesi. *Fonderia*, v. 6, Dec. 1957, p. 528.

Parts in Cu-Sn-Zn alloy were cast by filling molds with approximate proportions of 60% and 40% respectively of molten metal taken from cupola and from holding furnace containing material transferred from cupola. Material in holding furnace was inoculated with phosphorus Cu and Zn was added before casting. Tensile tests revealed satisfactory mechanical properties. (E10a, Cu-s)

268-E.* (Italian.) **Use of Tellurium in the Cast Iron Foundry.** *Fonderia*, v. 6, Dec. 1957, p. 529-530.

Tellurium as an addition agent for promotion of area hardness in castings; in mold varnish for improvement of surface hardness. Improvement of microstructure of castings by balanced additions of Te and graphite. (E25q; Te, NM-k36, AD-q)

269-E. (Italian.) **Die-Casting Developments in Europe and America.** *Fonderia*, v. 6, Dec. 1957, p. 539-547.

Highlights of some of the papers presented at Congress of European Committee on Die Casting held in Paris, May, 1957. 11 ref. (E13)

270-E. (Italian.) **Feeding Distance of Risers in Castings of Uniform Wall Thickness. Notes on Practice in Modern Steel Foundries.** Michele Notte. *Fonderia Italiana*, v. 6, Dec. 1957, p. 463-468.

5 ref. (E22q)

271-E. (Italian.) **Processing of Foundry Sands and Clays in Modern Mechanized Equipment.** G. Somigli. *Fonderia Italiana*, v. 7, Jan. 1958, p. 2-8.

(E18n, E18p, W19h)

272-E. (Italian.) **Qualitative and Quantitative Determination of Clay in Foundry Sands by Means of Differential Thermal Analysis.** C. Pelhan. *Fonderia Italiana*, v. 7, Jan. 1958, p. 13-18.

(E18r)

273-E. (Portuguese.) **Production and Casting of Aluminum Bronzes.** Isaac Berezin. *ABM, Boletim da Associacao Brasileira de Metais*, v. 13, Oct. 1957, p. 365-385.

18 ref. (E-general; *Al*, Cu-s)

274-E.* Further Studies on Some Factors Influencing Sinking Under Bosses on Thin Plates: The Role of Eutectic Nucleation. A. G. Fuller. *British Cast Iron Research Association, Journal of Research and Development*, v. 7, Feb. 1958, p. 157-170.

Effect of manganese, sulphur, inoculation with ferrosilicon, superheating temperature and furnace holding time upon sinking. Relationship between the degree of nucleation of the melt (as determined by eutectic cell counts) and sinking. Factors, such as decreased superheating temperature or inoculation, which increase the nucleation of the melt, promote sinking. 9 ref. (E25n; CI)

275-E. Survey of Australian Foundry Industry for the Six Months Ending Oct. 31, 1957. *Castings*, v. 4, Jan. 1958, p. 5-11.

(E-general, A4)

276-E. Shell Molding . . . Ten Years of Progress. *Foundry*, v. 86, Apr. 1958, p. 80-85.

Share of market achieved by shell moldings. (E16c, A4p)

277-E. Suppliers Discuss Developments in Resins and Molding Equipment. *Foundry*, v. 86, Apr. 1958, p. 86-89.

Suggestions for more efficient use of foundry resins. (E16c; NM-f45)

278-E. How Five Foundries Use Shell Molding. Robert H. Herrmann and Jack C. Miske. *Foundry*, v, 86, Apr. 1958, p. 93-103.

Experience of Albion Malleable Iron Co., Bendix Aviation Corp., Engineering Castings Inc., M. A. Harrison Mfg. Co. and Midwest Foundry Co. in the shell mold casting of gray iron, steel, brass and malleble iron. (E16c)

279-E. Shell Pattern Equipment Must Meet High Standards. Ray Olson. *Foundry*, v. 86, Apr. 1958, p. 104-106.

Shell molding patterns are difficult to design, tougher to make, expensive to buy. Basic requirements of shell patterns together with the problems involved. (E16c, E17)

280-E. Controlling Variables in Processing Shell Molding Sands. Jack E. Bolt. *Foundry*, v. 86, Apr. 1958, p. 107-109.

Results of tests at the Foundry Resin Laboratory, General Electric Co., concerning effects of certain variables on properties of resin-coated sand for shell molding. (E18r, E19c)

281-E. Diecasting Foundry Makes Automotive Hardware Parts. Robert H. Herrmann. *Foundry*, v. 86, Apr. 1958, p. 110-113.

Modern Al and Zn die-casting facilities and automatic equipment for machining, buffing and plating are included in new Ford plant for producing automotive hardware. (E13, T21c; Al, Zn, 5-61)

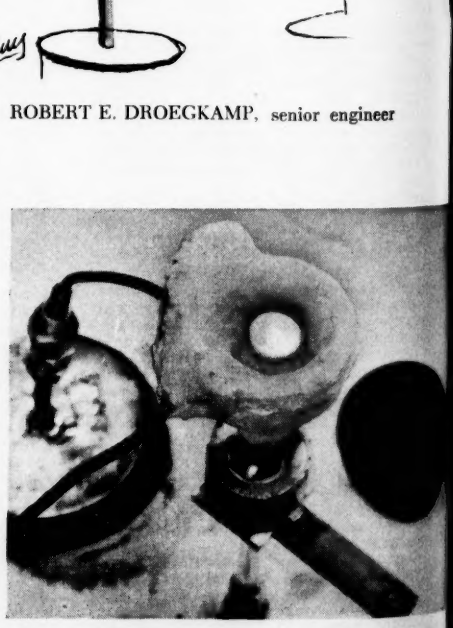
282-E.* Problems in Making Stainless Steel Castings. Ernest A. Schoefer. *Foundry*, v. 86, Apr. 1958, p. 114-119.

Problems encountered by producers of high-alloy castings made of Fe-Cr and Fe-Cr-Ni alloys to resist heat or corrosion. Table indicates standard designations and chemical composition ranges for heat and corrosion resistant castings. (E11; SS)

283-E.* Factors Affecting Carbon Pick-Up in the Cupola. Michael Perch and Charles C. Russell. *Foundry Trade Journal*, v. 104, Mar. 13, 1958, p. 291-296.

levitation

ROBERT E. DROEGKAMP, senior engineer



Typical levitation of alloy specimen in a ceramic-coated, specially shaped, radio-frequency induction coil.

melting of uranium-base fuel alloys

Electromagnetic levitation with simultaneous melting, pioneered by Westinghouse in 1949, is being investigated at Bettis as a tool for melting research quantities of pure uranium-base fuel alloys. Reactive metals such as U, Ti, V, Zr, Nb, Ta, and Mo cannot now be melted in any of the known refractory materials and still retain sufficient purity for precise metallurgical investigations. To avoid crucible contamination, Robert E. Droegkamp, senior engineer, has been developing a levitation melting technique for application to nuclear fuel development.

Levitation melting offers several advantages: each melting charge can be prepared easily by compacting powders or chips of the material; the specimen does not touch a crucible during heating or melting; the alloy is thoroughly mixed electromagnetically before chill casting; volatile impurities can be removed; and the molten alloy can be protected by a suitable atmosphere or vacuum.

The force necessary to levitate a given material is a function of the size, shape, and resistivity of the material, the size and shape of the induction coil, and the frequency and amplitude of the alternating current used. The high density and resistivity of uranium alloys pose problems. Instantaneous superheating causes evaporation and ionization that result in a short circuit to the coil. This allows the metal to cast itself.

To date, specimens of a uranium-base alloy weighing about 8 grams each have been levitated in the molten condition for periods up to 5 seconds at pressures up to 1×10^{-5} mm Hg. When this technique is perfected, it will be possible to prepare uranium alloys of higher purity than previously available for transformation, corrosion, phase diagram, and possibly irradiation studies.

This levitation melting process described briefly is only one of the many challenging projects which metallurgists encounter at Bettis. We welcome confidential inquiries from metallurgists interested in the excellent careers offered by the expanding nuclear power industry. U. S. Citizenship required.

Send your resume to M. J. Downey, Dept. #A-48, Bettis Atomic Power Division, Westinghouse, Box 1468, Pittsburgh 30, Pa.

BETTIS ATOMIC POWER DIVISION

Westinghouse

BETTER YOUR FUTURE AT BETTIS

Carbon solubility of various foundry cokes. Inverse correlation between solubility and ash content. Effects of Si and Mn content, coking time, and other variables. 9 ref. (E10a; CI, RM-j43)

284-E.* Influence of Blast Input, Coke Size and Melting Coke Ratios on Cupola Performance. Pt. 1. F. Danis and M. Decrop. *Foundry Trade Journal*, v. 104, Mar. 20, 1958, p. 319-326.

Detailed analysis of the effect of amount of coke, blast input and coke size on thermal efficiency of cupola, temperature and production of iron. (E10a; CI)

285-E. Influence of Blast Input, Coke Size and Melting Coke Ratios on Cupola Performance. Pt. 2. F. Danis and M. Decrop. *Foundry Trade Journal*, v. 104, Mar. 27, 1958, p. 351-358.

(Concluded.) (E10a)

286-E.* Gases in Cast Iron With Special Reference to Pickup of Hydrogen in Sand Molds. An Account of Recent Work and the Views of British Investigators. J. V. Dawson and L. W. L. Smith. *Modern Castings*, v. 33, Feb. 1958, p. 39-51.

Effects of gases, various alloying elements and components of sand molds on porosity of cast iron. (E25q; CI, 9-68)

287-E.* Observations on Pinhole Defects in White Iron Castings. R. W. Heine. *Modern Castings*, v. 33, Feb. 1958, p. 53-57.

Slag formation during cooling of the molten metal is a major cause of pinhole defects in white iron castings. Four identifiable types are observed: reaction pinholes, aspiration pinholes and bubbles, evolution pinholes, miscellaneous (isolated pinholes). Relation to the variable conditions of gating, pouring, sand and molding practices. (E11; CI-p, 9-69)

288-E.* Theoretical Concepts of the Packing of Small Particles. J. B. Caine and C. E. McQuiston. *Modern Castings*, v. 33, Feb. 1958, p. 58-61.

A mathematical analysis of the effects of particle size distribution on the packing configuration and density of foundry sands. (E18r)

289-E. Density of Sand Grain Fractions of the AFS Sieve Analysis. R. W. Heine and T. W. Seaton. *Modern Castings*, v. 33, Feb. 1958, p. 62-67.

Effects of fineness, impurities, geometric shape and jolting energy on the density of compacted silica sand grains. (E18r)

290-E. Controlled-Slag Hot-Blast Cupola. D. Fleming. *Modern Castings*, v. 33, Apr. 1958, p. 47-58.

14 ref. (E10a, W18d)

291-E. Purchase Specifications for Commonly Used Steel Foundry Mold and Core Sand Binders. E. G. Vogel. *Modern Castings*, v. 33, Apr. 1958, p. 59-62.

(E18n; NM-F45)

292-E.* Effect of Pressure During Solidification on Microporosity in Aluminum Alloys. S. Z. Uram, M. C. Flemings and H. F. Taylor. *Modern Castings*, v. 33, Apr. 1958, p. 63-68.

Aluminum alloys 356 and 195 were solidified under pressures varying from atmospheric (15 psi.) to 16.7 times atmospheric (250 psi.) Pressures greater than atmospheric were found to result in a substantial reduction of microporosity in sand cast test specimens. The test castings were adequately risered and the alloys thoroughly degassed. (E25q, 3-74; 9-68, Al)

293-E.* Foundry Characteristics of a Rammed Graphitic Mold Material for Casting Titanium. H. W. Antes, J. T. Norton and R. E. Edelman. *Modern Castings*, v. 33, Apr. 1958, p. 69-76.

Surface finish, shrinkage, compressive strength, permeability and thermal conductivity of an expendable graphitic mold. Amount of surface contamination of Ti cast into this type of mold. All of the variables were studied as functions of the molding pressure and moisture content of the graphitic material. 5 ref. (E19, W19g; Ti, NM-k36)

294-E.* Some Requirements for Successful Fluidity Testing. S. A. Prussin and G. R. Fitterer. *Modern Castings*, v. 33, Apr. 1958, p. 77-84.

A new fluidity tester (fluidimeter) is designed to insure reproducible metal flow. Techniques to determine the actual rate of flow of the molten metal stream within the fluidity test mold. (E25p, 1-53)

295-E.* Investment Castings Go Civilian. *Steel*, Mar. 3, 1958, p. 95-98.

Manufacturers producing intricate and hard-to-fabricate parts can now look for help from investment castings, due to cutbacks in aircraft programs. Although investment castings are expensive, this process offers many offsetting advantages, such as design freedom and a reduction in secondary operations. (E15)

296-E.* Automatic Metering of Magnesium Opens Cold Chamber Die Casting Applications and Markets. F. C. Bennett. Paper from "Magnesium in Perspective", Magnesium Association, p. 201-203.

Automatic supply of molten Mg alloy to cold chamber die-casting machines permits production rates equal to hot chamber Zn or Mg machines. Simple, safe, flexible process produces good quality castings. (E13; Mg)

297-E. Magnesium Precision Castings Open New Production Potential. L. H. McCreery. Paper from "Magnesium in Perspective", Magnesium Association, p. 601-610.

Castings with dimensional tolerances of ± 1/64 in., draft angle of 0 to 1° and wall thickness of 0.100 in. are produced, requiring little machining. These are lighter and less expensive than conventional castings requiring considerable machining and finishing work. (E15; Mg)

298-E.* Some Aspects of Control of Quality of Magnesium Alloy Castings. P. A. Fisher. Paper from "Magnesium in Perspective", Magnesium Association, p. 801-805.

While test results on samples may be valid, these results may or may not reflect the actual characteristics of the piece in service. Quality control must be based on a knowledge of the conditions under which the tested item will be used. (E-general, S21, S12; Mg)

299-E.* Cored Passages Open New Applications to Magnesium Castings. John L. Everhart. Paper from "Magnesium in Perspective", Magnesium Association, p. 1201-1208.

Unlined passages as small as ⅛ in. diameter, or of noncircular cross-section, can be produced. High complex arrangements with curve radii of 2½ to 3 in. permit nonturbulent fluid flow. These internal passages simplify design and maintenance, reduce costs. (E21; Mg)

300-E. (German.) Influence of Small Amounts of Foreign Elements in Casting Aluminum. R. Irmann. *Aluminium*, v. 34, Mar. 1958, p. 128-130.

12 ref. (E25, Q-general, 2-60; Al, *Be, B, Cr, Na, P, Ti*)

301-E. (German.) Defects and Faults in the Manufacture and Operation of Pressure-Casting Dies. Gustav Lieby. *Giesserei*, v. 45, Jan. 30, 1958, p. 60-64.

(E13, W19n, 9-71)

302-E. (German.) Development of Internal Stresses Leading to Cracks in Gray Iron Castings. H. T. Angus and W. G. Tonks. *Giesserei*, v. 45, Feb. 13, 1958, p. 81-86.

12 ref. (E25q, 9-72; CI-n)

303-E. (German.) Production of Spherodial Graphite Cast Iron by Blowing a Mixture of Calcium Carbide and Magnesium Into the Melt. Hans Abrecht and Kurt Giesen. *Giesserei*, v. 45, Feb. 27, 1958, p. 113-117.

11 ref. (E25q, CI-r, *Mg*, AD-p36)

304-E. (German.) Snake-Shaped Gate. Wilhelm Petzka. *Giesserei*, v. 45, Mar. 13, 1958, p. 147-148.

Purpose and importance when casting light metal alloys; dimensions; comparison with Rabinowitsch; applications. (E22p)

305-E. (German.) Oxidation Loss of Liquid Lead. E. Pelzel and H. Schneider. *Metall*, v. 12, Feb. 1958, p. 122-124.

Chemical mechanism; requirements for efficient melting of lead. 9 ref. (E10, R1h; Pb)

306-E. (German.) Basic Hot-Blast Cupola in the Integrated Steel Works. Heinz Voigt. *Stahl und Eisen*, v. 78, Mar. 6, 1958, p. 284-291.

5 ref. (E10a, 1-65, A4s; ST)

307-E. (Japanese.) Production of Cast Iron With Steel Core Inserts. Pt. 6. Influence of Casting Temperature. Taichito Usui and Yoshio Yamamoto. *Casting Institute of Japan, Journal*, v. 29, Nov. 1957, p. 755-757.

(E23, 2-61; CI, *ST*)

308-E.* (Japanese.) Effect of Moisture on Molten Cast Iron. Nobutaro Kayama, Toru Ishino and Kazuo Saito. *Casting Institute of Japan, Journal*, v. 29, Nov. 1957, p. 757-763.

Blown moist air at 1000° C. oxidized and increased chill tendency, total oxides, silica content and formed shrinkage cavities at 1400° C., no appreciable oxidation. High-temperature coke not changed. More moisture observed in cupola. (E10a; CI)

309-E.* (Japanese.) Effect of Titanium on Cast Iron Properties in Cupola Melting. Shigeyuki Hamada. *Casting Institute of Japan, Journal*, v. 29, Nov. 1957, p. 781-790.

With more than 0.17% Ti, eutectic structures of graphite appear. Dendritic austenite is observed in the microstructure with ferrite and pearlite in matrix although carbon and silicon contents are high. Higher mechanical properties are found than in ordinary cast iron. Supercooling occurs with high Ti content. 7 ref. (E25q, E10a, 2-60; CI, *Ti*)

310-E.* (Japanese.) Properties of Shell Cores Made by Blowing. Kaoru Kato. *Japan Foundrymen's Society, Journal*, v. 30, Jan. 1958, p. 19-24.

Most suitable air pressure is about 4 kg. per sq. cm. Shells of resin-coated sand containing only 2.5% resin have sufficient bending strength. Permeability of the shells is decreased. For 4% resin-coated sand, limited value of apparent density is 1.53 g. per cc. and value of porosity is 39.4%; for 2.5% resin content, values are 1.48 g. per cc. and 42.4% respectively. (E21, E19c; NM-f45)

311-E.* (Japanese.) **Efficiency of the Carbon Dioxide Process in Coremaking.** Yukio Kido and Jinichi Minamimura. *Japan Foundrymen's Society, Journal,* v. 30, Jan. 1958, p. 24-29.

Relationship between quantity and rate of carbon dioxide absorption and strength of hardened sand. Commercial binders and water glass were used. Amount of CO_2 absorbed is less than 0.7% of sand mixture. Better strength is obtained with 0.35% absorption. Amount of gas needed for hardening is 0.6-0.87% of the sand mixture. There is no advantage in mixing air with CO_2. (E18n, E21)

312-E. (Japanese.) **Sieves for Molding Sand Preparation. Pt. 1. Experiments on Various Factors.** Ryojiro Kono and Kenji Hashimoto. *Japan Foundrymen's Society, Journal,* v. 30, Jan. 1958, p. 29-37.

5 ref. (E18r, W19h)

313-E.* (Japanese.) **Treatment of Molten Iron by Electrolyzing Molten Slag. Pt. 3.** Masuteru Maruyama. *Japan Foundrymen's Society, Journal,* v. 30, Jan. 1958, p. 37-45.

The treated iron had the mixed structure of eutectic fine graphite and flaky graphite. Perfect nodular graphite structure was obtained by inoculation with 1-2% calcium-silicon. Inoculation with Fe-Si accelerated the growth of fine and nodular graphite to the flaky form. Relationship between cooling rate, structure and growth process. 17 ref. (E25q; CI-r)

314-E. (Japanese.) **Die Casting Aluminum-Magnesium Alloys.** Takuichi Morinaga. *Japan Foundrymen's Society, Journal,* v. 30, Jan. 1958, p. 45-51.

Means for preventing burning of the Mg, decreasing casting stresses and preventing hardness variations. (E13, 2-60, 2-61; Al, Mg)

315-E. (Swedish.) **Design of Castings With Regard to Molding. Pt. 2.** Alrik Ostberg. *Gjuteriet,* v. 48, Jan., 1958, p. 1-7.

(E19, 17-51)

316-E. (Swedish.) **"Inverse Grayness" in Malleable Iron.** Gustaf Ostberg and Carl-Ewest Gustafsson. *Gjuteriet,* v. 48, Jan. 1958, p. 8-11.

Possible causes of a gray surface rim in white iron castings. 9 ref. (E11, 2-61, 9-69; CI-p)

317-E. (Swedish.) **Design of Castings With Regard to Cores.** Alrik Ostberg. *Gjuteriet,* v. 48, Feb. 1958, p. 19-24.

(E21g, 17-51)

318-E. (Swedish.) **Wholly Rammed Cupola Linings.** Folke Sandford. *Gjuteriet,* v. 48, Feb. 1958, p. 25-27.

Melting test results show that ganister should have low moisture content and linings carefully dried to avoid cracks. (E10a; RM-h35)

319-E.* **Matchplates for Profit.** Ormie R. Scott. *Canadian Metalworking,* v. 21, Feb. 1958, p. 32-34.

While limited casting requirements often dictate the use of loose wood patterns, many foundries are accepting too many borderline casting orders involving loose patterns. When planning production equipment, several pattern materials and procedures are available; each is governed by the requirements of the particular job. If a loose wooden pattern is in existence, mounting this on a wood or metal plate can increase production. (E17)

320-E. Casting Aluminum Letters. *Light Metal Age,* v. 16, Feb. 1958, p. 22-24.

(E-general; Al-b)

321-E. Die Temperature Control. *Metal Industry,* v. 92, Jan. 31, 1958, p. 89-91.

(E13, W19n, 2-61)

322-E. Graphite Molds, Pressure Pouring System Casts Steel Freight Car Wheels. R. E. Ford. *Western Metalworking,* v. 16, Feb. 1958, p. 46-49.

(E23, W19g; NM-k36, ST)

323-E.* (English.) **Study of High Strength Cast Iron. Pt. 2. Improvement of Cast Iron by O_2 Blowing.** Ichiron Iitaka and Kokichi Nakamura. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 1-4.

Oxygen blowing as a method of reducing carbon and silicon content. Relation between quantity of oxygen, percentage of carbon, percentage of silicon, tensile strength and blowing temperature. Effects of inoculation with calcium, silicon and aluminum. (E25r; CI-c)

324-E. (English.) **Some Studies on Cupolas.** Toru Ishino. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 5-8.

Study of blast pressures at wind box and at each section of a model cupola under nonburning conditions with varying tuyere ratio, effective height ratio, coke size and blast volume. (E10a, W18d)

325-E.* (English.) **Ability of Spherization of the Additional Metals for Spheroidal Graphite Cast Iron.** Takaji Kusakawa. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 9-12.

Holes in specimens of Swedish charcoal pig iron packed with calcium, magnesium or misch metal and heated to 1160° C. for 30 min. Metallographic evaluation of effect of addition on formation of spheroidal graphite and on other microstructural changes. (E25q; CI-r)

326-E. (English.) **Testing Method of Clay Content in Foundry Sand.** Jiro Kashima. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 27-31.

Use of adsorption and photometric analysis to evaluate characteristics of clay in foundry sand. Compares adsorption with the green strength of the sand. (E18r; RM-h35)

327-E.* (English.) **Study of Organic Binders for Molding Sand.** Jiro Kashima and Hiroshige Suzuki. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 33-37.

Investigates dryers for reducing hardening time of oil-bonded core sand and oxidizing type. Dryers such as cobalt-naphthanate shorten hardening time of linseed oil-bonded core sand. (E18n)

328-E. (English.) **Gas Pressure in Mold Cavity. Pt. 2.** Mototaka Mutaguchi. *Waseda University, Castings Research Laboratory Report,* no. 8, Nov. 1957, p. 39-42.

Investigates relation between permeability of sand mold and gas pressure of mold cavity by means of tube rammed with sand and gas generating material. Mathematical expression of relationship. (E18r, E19)

329-E. (English.) **Determination of the Melt Quality of 85-5-5-5 Red Brass.** Shigeo Oya and Umewo Honma. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 43-46.

Surface appearance and fracture of red brass castings containing gases and aluminum and silicon impurities observed in an attempt to develop method for evaluating melt quality. (E25, E23; Cu-n)

330-E. (French.) **Solidification Mechanism in Gray Iron.** Albert De Sy. *Fonderie Belge,* v. 2, Feb. 1958, p. 43-51.

Spontaneous nucleation and effect of impurities. Mechanism of eutectic crystallization, differences between crystallization of normal and abnormal eutectic. Conclusions are applied to the study of the abnormal eutectic of gray iron casting with lamellar graphite. 10 ref. (E25n; CI-n)

331-E. (Russian.) **Steel Casting With Exothermic Heads on Molds.** I. M. Barabash and A. S. Shuper. *Liteinoe Proizvodstvo,* Dec. 1957, p. 4-5.

Application of exothermic mixtures in steel casting for heavy machine building industry, results in improved quality and considerable saving of metal. (E22n, W25, 17-57; ST)

332-E. (Russian.) **Effect of Bismuth and Boron on Shortening Annealing Time of White Iron.** I. F. Kurtov, V. A. Zakharov, N. P. Chichagova and S. V. Ryabokon. *Liteinoe Proizvodstvo,* Dec. 1957, p. 20-21.

Addition of small quantities of Bi and B to white iron shortens annealing time by 25-35%, doubles Cr limits without lengthening annealing time, simplifies technology of obtaining malleable iron, makes possible use of malleable iron as structural material. 4 ref. (E25, J23; CI-s, *B, Bi*)

F Primary Mechanical Working

106-F.* **Rolls and Rolling. Sheet Piling.** E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 46, Mar. 1958, p. 310-312, 337, 339, 341, 345-348.

Rolling techniques and roll design requirements for production of sheet piling. (F23; ST, 4-55)

107-F. Primary Roll Neck Bearings and Their Protection. George Sackerson. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 103-110.

In order to get maximum bearing life, polished roll necks, plentiful, clean, cool water for cooling, a dependable source of grease, and scale guards are necessary. Accurate maintenance records are required to insure replacement when required. (F23, W23m; ST, NM-h)

108-F.* **Seamless Tube Making by the Calmes Process.** Albert Calmes and Clyde A. Roberts. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 124-132.

Ingots are taken directly from the openhearth and made into seamless tubing in one continuous process. Principal steps are: ingot heating, press piercing, elongating, rotary forging, reheating, sizing, polishing, finishing and testing. (F26; ST)

109-F. J & L Starts Operation of 44-In. Mill at Aliquippa. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 164-165, 169-170.

A semicontinuous hot strip rolling mill produces coils up to 40 in. wide and weighing 20,000 lb. Operation is nearly automatic, the rolling being controlled by programs fed through IBM equipment to digital analog equipment. (F23, W23c, 18-74; ST)

110-F. Cored 90-Mm. Gun Tubes Extruded in 5 Min. Henry J. Decelle, Adam A. Krystofik and John Penrose. *Metalworking Production*, v. 102, Jan. 31, 1958, p. 190-193.

Pilot scale operations indicate that extrusion method produces tubes superior to forging with significant savings in time and material. (F24, T2m; 4-60)

111-F.* Improvement of Castings by Press Forging. A. H. Murphy, L. L. Clark and W. Rostoker. *Modern Castings*, v. 33, Mar. 1958, p. 95-102.

Significant increases in the proof, yield and ultimate strengths of two cast high-strength Al alloys and one cast Mg alloy can be obtained by forging which produces 15-30% deformation. (F22; Al, Mg, 5)

112-F.* Press Forging Strengthens Light Metal Castings. W. Rostoker. *Modern Metals*, v. 14, Feb. 1958, p. 42-45.

Forging of light metal castings at just under peak aging or recrystallization temperature increases yield strength up to 84% in Al and 58% in Mg. (F22; Al, Mg, 5-61)

113-F. Induction Heating for Hot Forming. The "New Look" in Induction Methods for Forging and Extrusion Heating. Phillip W. Morse. *Steel Processing and Conversion*, v. 11, Feb. 1958, p. 95-101.

(F21b, 1-69, F22, F24)

114-F.* Press Forging of Ingot Uranium. John A. Fellows and H. J. Schaffer. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 67-71.

Practice employed in preparing ingots produced by thermit reaction between uranium tetrafluoride and magnesium for secondary rolling or extrusion. (F22, C26; U, 5-59)

115-F.* Rolling of Uranium. Gale S. Hanks, James M. Taub and Denton T. Doll. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 73-86.

Rolling schedules for reducing uranium plates and ingots to sheet of deep drawing quality. Hot rolling at 625° C. reduces ingot to intermediate thickness followed by warm rolling at 300° C. with and without intermediate anneal and with varying amounts of cross rolling to reduce sheet to final thickness. Relation of percent reduction and temperature of hot rolling to grain structure, ultimate strength, yield strength, elongation and hardness. Results of cup and mechanical tests indicate the variation of warm rolled sheet characteristics with rolling direction, percentage of reduction and method of annealing. 4 ref. (F23, Q-general; U, 4-53)

116-F.* Extrusion of Uranium. P. Loewenstein. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 87-94.

Phase transformation, oxidation, galling and other problems encountered in extrusion of uranium. Technique, die design, canning material, lubricants, extrusion constants, temperatures, speed, surface finish, microstructure and shapes of uranium-rich alloys extruded in the alpha phase or in the gamma phase. 7 ref. (F24; U)

117-F.* Cold Working of Uranium. James M. Taub, Denton T. Doll and Gale S. Hanks. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 95-106.

Uranium can be rolled, deep drawn, swaged and drawn into fine wire without difficulty at temperatures above the transition which exists between 100 and 150° C. Effect of percentage reduction and strain on grain size of cold rolled sheets following annealing. Effect of annealing atmosphere on mechanical properties: influence of impurities on cold working characteristics. (F23, F25, G4, F28, 1-67; U)

118-F. (French.) **Latest Methods of Aluminum Extrusion.** Charles H. Wick. *Machine Moderne*, v. 52, Jan. 19.8, p. 65-68.

(To be continued.) (F24, W24g)

119-F. (German.) **Net Frequency Induction Equipment for Hot Forming.** A. Finzi. *Deutsche Elektrotechnik*, v. 11, Aug. 1957, p. 337-380.

Preheating of Al, Ag alloy, bronze and Cu. (F21b, W28s; Al, Ag, Cu)

120-F. (German.) **New Knowledge Gained Through the Drawing Cut of Plate-Shearing Machines.** Alfred Wutherich. *Werkstatt und Betrieb*, v. 90, Aug. 1957, p. 490-492.

Examination of cutting conditions of plate shearing machines having oblique top cutter. (F29q, W24m)

121-F. (Japanese.) **Metal Flow in Oblique Rolling.** Shinsaku Mise, Toyohiko Okamoto and Akira Funatch. *Sumitomo Metals*, v. 9, July 1957, p. 143-157.

Displacement and deformation of materials when a solid round billet is pierced in a piercing mill to form a hollow cylinder. (F26q)

122-F.* Closing of Internal Cavities in Forgings by Upsetting. A. Tomlinson and J. D. Stringer. *Iron and Steel Institute, Journal* v. 188, Mar. 1958, p. 209-217.

Experiments with newly developed upsetting tools; conditions and mechanism of the closure of the holes; mechanical properties of healed holes; practical application of results. (F22j)

123-F.* Theory of Extrusion. J. F. W. Bishop. *Metallurgical Reviews*, v. 2, 1957, p. 361-390.

Extrusion mechanics, stress, slip lines, plane-strain extrusion, dead metal regions, residual stresses, preferred orientations, anisotropy, temperatures, practical applications. 29 ref. (F24; 10-51)

124-F. Rolling of Uranium (Sheet). T. L. Crisler, J. D. Duncan, D. S. Fisher, G. S. Hawks and V. Vigil. *U. S. Atomic Energy Commission*, LA-2071, Dec. 1957, 217 p.

12 ref. (F22, 4-53; U)

125-F.* Giant Press Presents New Potentials for Magnesium Extrusions. K. F. Braeuninger. Paper from "Magnesium in Perspective", Magnesium Association, p. 701-707.

New 13,200-ton extrusion press is capable of extrusion ratios up to 100-to-1. A wide variety of shapes previously either impossible or extremely difficult to extrude are now practical. (F24, 1-52; Mg)

126-F. (German.) **Design and Operation of a Modern Continuous Mill Train Rolling Medium Strip.** Herbert Severing. *Stahl und Eisen*, v. 78, Feb. 20, 1958, p. 205-214.

(F23, 1-61, W23c)

127-F. (Japanese.) **Extrusion Pressure and Properties of Extruded Rods of Pure Aluminum and Its Alloys.** Yoshikazu Hosoi and Mamoru Yukawa. *Light Metals (Tokyo)*, v. 8, Jan. 1958, p. 39-42.

5 ref. (F24, J23, M27, Q23a; Al)

128-F. Punch Cards Program Rolling Mill. *Iron Age*, v. 181, Feb. 20, 1958, p. 92-93.

(F23, W23c, X14; ST)

129-F. Titanium Extrusions Cut Production Costs. N. J. Feola. *Iron Age*, v. 181, Mar. 27, 1958, p. 96-98.

(F24, 17-53; Ti-b)

130-F.* Extrusion Press Tooling Pt. 2. Structural Streaking. Richard Baugh and John Lyons. *Light Metal Age*, v. 16, Feb. 1958, p. 27-29.

Types and causes and remedies for structural streaking in Al extrusions. (F24, 9-71; Al)

131-F. (English.) **Manufacture of Large High-Pressure Hollow Bodies.** *Aciers Fins et Speciaux Francais*, no. 27, Dec. 1957, p. 82-86.

Method of production, advantages and limitations of one-piece steel forgings to be used for high-pressure containers. (F22, T26q, 4-51; ST)

132-F.* (Czech.) **Influence of Metallurgical Factors on Billet Quality and Yield in the Rolling of Seamless Tubes.** Vilém Friedrich. *Hutnické Listy*, v. 12, no. 12, 1957, p. 1077–1083.

Plant scale tests in rolling seamless tubes from billets and round ingots show principal factors determining quality and yield of tubes are the kind and quality of steel. Yields after rolling tubes under different production conditions from melt of openhearth and basic bessemer steel. Other fabricating factors influencing yields. (F26s; ST-e, ST-g)

133-F.* (Czech.) **A Planetary Rolling Mill.** Anatol Velsovsky. *Hutnické Listy*, v. 12, no. 12, 1957, p. 1083-1087.

Mathematically analyzes working processes in Sendzimir planetary rolling mill and calculates forces which exert influence on the backup roll. Theoretically no force is transmitted to pressure screws of the mill since the weight of the backup roll assembly is sufficient to balance the force of the resistance against deformation of the material. (F23, W23, 1-52)

134-F.* (Polish.) **Establishment of the Optimum Procedure for Subdivision of 8.5-Ton Ingot and Classification of Slabs for Sheet Steel Deep Drawing.** Waclaw Leskiewicz, Ryszard O'Donnel, Stanislaw Spiewak and Eugeniusz Wosiek. *Hutnik*, v. 24, Dec. 1957, p. 477-488.

General characteristics of deep-drawn steel sheet. Principles of ingot subdivision and slab classification. Investigation of low-carbon rimmed steel ingots and tabulation of results of mechanical working. 7 ref. (F23, G4b; ST-d, 5-59)

135-F. (Russian.) **Selection of Method of Heating Billets in Forging and Stamping Plants.** V. N. Glushkov. *Vestnik Mashinostroeniya*, v. 38, Jan. 1958, p. 56-62.

10 ref. (F21b, F22, G3)

Secondary Mechanical Working

Forming and Machining

174-G.* Chemical Milling: Where and How. Pt. 1. Where to Use Chemical Milling. Jay Sullivan. *American Machinist*, v. 102, Mar. 24, 1958, p. 122-124.

Application of chemical milling outside of aircraft industry. Al, Ti, Mg and steel alloys may be milled by chemical solutions. (G24b; Al, Ti, Mg, ST)

175-G.* Chemical Milling: Where and How. Pt. 2. How to do Chemical Milling. Ken Clark. *American Machinist*, v. 102, Mar. 24, 1958, p. 125-127.

Procedure for etching Al airplane wing-tip panels. Rate of etching de-

pends on direction of grain, alloy, previous heat treatment, time, temperature, agitation, angle of immersion and spacing of parts in the bath. (G24b; Al)

176-G. **How to Get the Best From Ceramics.** H. D. Moore and D. R. Kibbey. *Canadian Machinery*, v. 69, Jan. 1958, p. 65-66, 126-127.

(To be continued.)
(G17, T6n; 6-70)

177-G. **Computer Controlled Flame Profiling of Steel Plate.** *Industrial Finishing*, v. 10, Feb. 1958, p. 33.

(G22g, 4-53; ST)

178-G. **Where Do We Stand With Metalcutting Research.** M. Eugene Merchant and Paul A. Meline. *Machine and Tool Blue Book*, v. 53, Feb. 1958, p. 103-109.

Machinability testing and sound engineering principles must be combined to solve problems and control rising costs of machining high-strength metals. Tool wear more important than tool life. Automated lines, quicker change of work piece and cutter are economically important as metal is removed at faster rates. (G17, 17-52, A9n)

179-G. **There's a Big Future for Impact Extrusion of Steel.** H. W. Byies. *Metalworking Production*, v. 102, Jan. 31, 1958, p. 201-203.

(G5; ST)

180-G. **Shop Design for Contour Machining.** Gilbert C. Close. *Modern Machine Shop*, v. 30, Feb. 1958, p. 102-107.

(G17c)

181-G. **Machining Metal Honeycombs.** Thomas A. Dickinson. *Modern Machine Shop*, v. 30, Feb. 1958, p. 108-109.

Electrical discharge methods allow machining of Al, stainless steel and Ti honeycombs to 1.0005 tolerances. (G24a, 7-59; SS, Ti)

182-G. **Surface Grinding to Order.** John E. Hyler. *Modern Machine Shop*, v. 30, Feb. 1958, p. 124-127.

(G18k)

183-G.* **Chem-Mill: Shortcut to Hard-to-Machine Magnesium Parts.** Hugh H. Muller. *Modern Metals*, v. 14, Feb. 1958, p. 62-65.

A simple chemical etch method reduces weight of Mg parts, allows simpler forming, and reduces reject rate, without affecting physical properties. (G24b; Mg)

184-G. **Subzero Processing.** John Starr. *Pacific Factory*, v. 89, Jan. 1958, p. 22-24.

Dimensional stability and machinability of cast and wrought forms of Al and Mg alloys can be improved by cold treatment. The low-temperature exposure and over-aging not only improve stability but accelerate structural changes that might take place in service. Thus dimensional deviations can be detected and corrected while materials are being fabricated.
(G17, J27d, 2-63; Al, Mg)

185-G.* **Chemical Milling.** C. H. Lundquist. *Product Engineering*, v. 29, Feb. 3, 1958, p. 50-53.

Procedures and applications.
(G24a)

186-G. **Explosive Forming.** William Edwards. *Production*, v. 41, Feb. 1958, p. 61-63.

(G1, G4, G14b)

187-G. (English.) **Experimental Study on Machining of Pearlite Cast Iron.** Keiji Okushima and Kiyoshi Minato. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Oct. 1957, p. 669-674.

Fine boring with jig borer; the best cutting conditions were determined from roughness of machined surface and the cutter wear. Several kinds of tungsten carbide tools were tested. (G17d; CI)

188-G. (German.) **Electro-Erosion Machining in Hungary.** K. Wittmann. *Fertigungstechnik*, v. 7, Nov. 1957, p. 532-535.

Description of Hungarian plants; advantages of the process. (G24a)

189-G. (German.) **Application of Oxygen Lance Using Steel Wire or Flux Powder.** H. Jansen. *Schweissen und Schneiden*, v. 10, Jan. 1958, p. 20-26.

6 ref. (G22g)

190-G. (German.) **Methods of Machining.** Kurt R. Pawlowitz. *Technik und Betrieb*, v. 9, Sept. 1957, p. 131-134.

A survey of methods, materials and tools for machining metals with special consideration of milling and turning. (G17a, G17b, W25)

191-G. (Japanese.) **Cutting Mechanism of Soft Metals.** Keiji Okushima and Katsundo Hitomi. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Oct. 1957, p. 674-680.

Dry cutting of soft metals such as lead at low speed. 6 ref. (G17; Pb)

192-G. (Japanese.) **Failure of High-Speed Steel Tools on Cutting of Mild Steel.** Keiji Okushima and Nobii Osaka. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Oct. 1957, p. 680-683.

By cutting mild steel with a specially designed tool, the process of wear was investigated, especially flank wear, crater wear, the tool contour at the end of tool service, and the effect of cutting conditions. (G17, Q9, T6n, 17-57; ST, TS)

193-G. (Japanese.) **New Method of Cold Extrusion of Steel.** Mahito Kunogi. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Oct. 1957, p. 742-749.

As a result of experimental studies on the effects of tool shape, extrusion speed and heat treatment of work materials, the extrusion pressure in this method is reduced by about 40%. 11 ref. (G5; ST)

194-G. (Japanese.) **Cold Extrusion of Alloy Steels.** Mahito Kunogi. *Japan Society of Mechanical Engineers, Transactions*, v. 23, Oct. 1957, p. 749-756.

The new method has been successfully applied to a wide variety of steels, such as structural steel, nitriding steel, special toolsteel, bearing steel and austenitic stainless steel. 15 ref. (G5; ST, SS, TS)

195-G. (Japanese.) **Plate Pressing.** Yasuo Kasugo. *Metals*, v. 27, Dec. 1957, p. 934-938.

(G1; 4-53)

196-G. **Explosives Become Portable Power Packs.** Annesta R. Gardner. *Product Engineering*, Jan. 6, 1958, p. 56-60.

Baby rockets are proposed for use in varied applications, including forming of metals such as Ti and stainless, which are difficult to shape by usual methods.
(G23; Ti, SS)

197-G. **Suggestions on Designing for Machining Heat Resistant Alloys.** R. D. Halverstadt. *Steel Processing and Conversion*, v. 44, Mar. 1958, p. 141-149, 164.

Tendency of heat resistant alloys to work harden rapidly, rapid tool dulling, and high cutting forces necessary require consideration in design of parts made of these alloys. 9 ref. (G17; SGA-h, SS)

198-G. **Automatic Flame Profiling of Plate in Shipyard Practice.** W. H. Pearse and R. R. Sillifant. *Welding and Metal Fabrication*, v. 25, Dec. 1957, p. 461-468.

System utilizing heat control and programming for profiling ships' plate with oxygen cutting nozzles. 11 ref. (G22g, T22; 4-53)

199-G.* **New Technique Makes No-Draft Pressing Possible, Economical and Practical.** Collins Fuqua. Paper from "Magnesium in Perspective", Magnesium Association, p. 301-305.

Pressing instead of forging blanks of Mg alloy produces improved grain flow, highly accurate dimensions, conserves material, reduces machining. (G1; Mg)

200-G. (German.) **Principles of Metal Spinning.** R. Beck and H. Gross. *Fertigungstechnik*, v. 7, Oct. 1957, p. 461-464.

Semi or full automation keeps metal spinning up to date and economical in production for shaping of symmetrical circular articles. Equipment and operation. 9 ref. (G13)

201-G. **Titanium Is Roll-Formed Hot.** *American Machinist*, v. 102, Feb. 24, 1958, p. 111.

(G11, T24, 2-62; Ti-b)

202-G. **Flame Cutters Trace Fast Patterns.** *Iron Age*, v. 181, Feb. 6, 1958, p. 110.

(G22g; ST)

203-G.* **Metallography Solves a Tough Machining Problem.** A. J. Belli. *Iron Age*, v. 181, Feb. 20, 1958, p. 96-98.

Machinability of drilling operation varied in wear-resistant, iron-base alloy castings for engine valveguides. Analysis that combines routine hardness measurements with conventional metallography shows the predominance of a particular structure mostly affecting machinability. Since these structures of primary carbides will not respond to heat treating, the quantity must be controlled in the casting operations where they are formed.
(G17k, M27; ST, SGA-m)

204-G. **How Cold Hobbing Shapes Intricate Parts.** Alex Phillips. *Iron Age*, v. 181, Apr. 3, 1958, p. 91-93.

(G17b, 1-67)

205-G. **Aluminum Impacts Open New Areas for Design.** E. J. Egan, Jr. *Iron Age*, v. 181, Apr. 3, 1958, p. 98-100.

Applicaion of impact extrusion.
(G5, 17-51; Al-b)

206-G. **Tips on Spinning Stainless Parts.** *Iron Age*, v. 181, Apr. 3, 1958, p. 101-103.

(G13; SS)

207-G. **Learn to Work Sheet Metal the Low-Cost Way.** *Iron Age*, v. 181, Apr. 10, 1958, p. 104-105.

Stretch forming, Guerin trapped rubber forming, metal spinning, power roll forming.
(G9, G11, G13, G14)

208-G.* **Compressive Deformation as a Means of Effecting Stress Relief in Aluminum Forgings.** R. E. Kleint and Frank G. Janney. *Light Metal Age*, v. 16, Feb. 1958, p. 14-21.

Mechanism of compressive deformation to relieve residual stresses in 7075 and 2014 Al alloy forgings. Dimensional stability and mechanical properties of specimens stress-relieved by different percentages of compressive deformation and with alloys in T6 or W heat treat conditions. (G23, Q25h, Al, 4-51)

209-G.* Changeover Progressive Dies Cut Costs on Short-Run Jobs. *Metalworking*, v. 14, Mar. 1958, p. 8-9.

Five-station progressive dies are used for forming picture-tube supports in two different lengths. Movable inserts and stock guides permit stamping these in same set of dies. (G3, W24n, 1-52)

210-G. (English.) **Drawing of Sheet Through Rotation Roll.** H. Yamanouchi and I. Hayashi. *Waseda University, Castings Research Laboratory, Report*, no. 8, Nov. 1957, p. 63-66.

Drawing of sheet by forward tension. Drawing forces and roll pressures theoretically formulated and compared with experimental values. (G11, 4-53)

211-G. (Russian.) **Technology of Disk, Rotor and Ring Stamping.** I. S. Kvater. *Vestnik Mashinostroeniya*, v. 38, Jan. 1958, p. 48-53.

(G3)

212-G. (Russian.) **Theory of Drawing of Intricate Shapes.** A. D. Tomlenov. *Vestnik Mashinostroeniya*, v. 38, Jan. 1958, p. 53-56.

8 ref. (G4, 3-73)

H Powder Metallurgy

54-H. Iron Powder Made by the H-Iron Process. Jerome F. Kuzmick and Kenneth W. Bruland. *Metal Progress*, v. 73, Mar. 1958, p. 92-96.

Magnetite concentrate of high purity is reduced by hydrogen (97% purity) at 400 psi. and 1000° F. to prevent reoxidation. Hydrogen is made from the coke oven gas. Various grades of iron powder are suitable for molding, for a chemical reagent, and for high-grade melting stock. (H10c; Fe)

55-H. Powder Metallurgy of Uranium and Uranium Alloys. John L. Zambrow. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 117-121.

5 ref. (H-general; U)

56-H. Fabrication of Bulk Form Uranium Dioxide for Use as Nuclear Reactor Fuel. J. Glatter. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 131-134.

Slip casting, hydraulic extrusion and cold pressing processes. Effect of mechanical comminution and addition of titanium dioxide on the density of sintered rods. (H14, H10e, H11k, T11g; U)

57-H.* Fabrication of High-Density Uranium Dioxide Fuel Components for the First Pressurized Water Reactor Core. T. J. Burke, J. Glatter, H. R. Hoge and B. E. Schaner. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 135-143.

Procedures and equipment used in mechanical agglomeration of the uranium dioxide powder, compaction in automatic presses and sintering; variation of final sintered density with compacting pressure, sintering time, and sintering temperature. (H14, H15, H11k, T11g; U, 14-68)

58-H. (German.) **Production of Sintered Iron-Phosphorus Alloys.** G. Blum. *Fertigungstechnik*, v. 7, Nov. 1957, p. 504-507.

(H-general; Fe, *P*)

59-H. (German.) **Particle Size and Lattice Distortion of Powdered Tungsten and Tungsten Carbide.** H. Hendus, W. Dawihl and G. Bartsch. *Zeitschrift für Metallkunde*, v. 48, Dec. 1957, p. 615-624.

Determination by X-ray and electron microscopy (Hall's method). Influence of carburization and grinding duration. (H11j, M21e, M21f; W, 6-69)

60-H. (Russian.) **Forty Years of Soviet Powder Metallurgy.** M. Yu. Bal'shin and G. V. Samsonov. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 15-25.

33 ref. (H-general)

61-H.* Powder Metallurgy. Pt. 9. J. F. C. Morden. *Metal Industry*, v. 92, Jan. 17, 1958, p. 43-46.

Sintering of Fe and Cu using salt and liquid metal baths for heating. Sintering of W, Mo, Ta, Ti and Zr by high-frequency induction with or without vacuum. Physical properties of resulting alloys. (H15)

62-H. Hot-Pressing of Electrolytic, Dehydrided, and Calcium-Reduced Thorium Powders. R. H. Witt and H. M. McCullough. Sylvania Electric Products, Inc. *U. S. Atomic Energy Commission*, SEP-224, Sept. 11, 1956, 37 p.

6 ref. (H14h, H11; Th)

63-H.* (German.) **Iron-Copper-Graphite Sinter Materials.** P. U. Gummeson and L. Forss. *Planseeberichte für Pulvermetallurgie*, v. 5, Dec. 1957, p. 94-101.

Results of investigation on powdered iron with addition of graphite and copper. Carbon-copper sinter steels have some advantages, especially hardness, strength and gage stability. They are not susceptible to fluctuation of sinter atmosphere. Ductility is somewhat low. (H-general, Q-general; Fe, *Cu*, NM-k37)

64-H.* (German.) **Uranium Alloys Sintered by Impregnating Process.** R. Kieffer and K. Sedlatschek. *Planseeberichte für Pulvermetallurgie*, v. 5, Dec. 1957, p. 104-120.

Impregnation technique. Methods for using slightly wettable and slow impregnating combinations. Porous sinter bodies of metals, carbides, borides, nitrides and silicides. (H16d, H15; U)

65-H.* (German.) **Investigation of Sintering and Recrystallization Processes.** W. Rutkowski. *Neue Hutte*, v. 3, Jan. 1958, p. 37-43.

In two binary systems—Cu-Fe and Cu-W — microhardness, electrical resistance, bending strength, specific weight and oscillation were tested. Influence of added oxides. Recrystallization theory and experiments with recrystallization of pure Ag and of Ag with added W. (H11, H15, N5; Cu, *Fe*, *W*, *Ag*)

J Heat Treatment

108-J. High Velocity Gas Stress Relieving Furnace. Edward M. Yard. *Iron and Steel Engineer*, v. 35, Feb. 1958, p. 95-100.

Furnace employs gas at 700° F. circulating at 7000 ft. per min. to stress-relieve ⅜-in. steel wire strand at the rate of 32 to 36 ft. per min. (J1a, W27g, ST, 4-61)

109-J. Some Spring Heat Treating Practices Defined. James Maker. *Metal Treating*, v. 9, Jan-Feb. 1958, p. 2-3, 36, 42, 43.

Stress relieving, hardening, tempering and finishing processes applied to springs. (J1a, J26, J29, T7c; ST, Ni, Be, Cu)

110-J.* Heat Treating in Vacuum. Horace B. Drever. *Metal Progress*, v. 73, Mar. 1958, p. 108-109.

Vacuum melting is a familiar process; vacuum heat treating is relatively new. Annealing, tempering and hardening are possible, though some precautions must be observed. Examples. (J2, 1-73)

111-J. (French.) **Kinetic and Structural Phenomena Occurring During the Carburizing of a Pure Iron.** Gaston Collette, Paul Gendrel and Leon Jacque. *Comptes Rendus*, v. 246, Jan. 20, 1958, p. 419-422.

(J28g; Fe-a)

112-J. (French.) **Hardening and Machining at Temperatures Below Zero.** R. J. Delaney. *Machine Moderne*, v. 52, Jan. 1958, p. 25-29.

Improved quality of metal aircraft parts obtained through three variations of below-zero treatment; quenching, sprinkling during machining and temperature changes from subzero to 212° F. (J26q, G17, 2-63)

113-J. (German.) **Influence of Aluminum Content on Annealed Surface Structure and on Nitrided Case of 35CrA16.** H. Burger. *Fertigungstechnik*, v. 7, Dec. 1957, p. 552-556.

Increasing Al content advances the decarburization and shifts the Ac transformation to higher temperatures. The nitriding depth is reduced. (J28k, M27, AY, *Cr*, *Al*)

114-J.* (German.) **Heat Treatment of Cast Iron for Increasing Wear Resistance.** J. Mainke. *Fertigungstechnik*, v. 8, Jan. 1958, p. 33-36.

Hardening, tempering and annealing; their mechanism and technique. Results of experiments. (J-general, Q9n; CI)

115-J. (German.) **Carburizing Steel by Liquid Hydrocarbons.** Franz Michel. *Industrieblatt*, v. 57, Oct. 1957, p. HT93-HT97.

(J28g; ST)

116-J. (German.) **Improvement of Quality of Tools by Proper Heat Treating.** F. Haberli. *Industrieblatt*, v. 57, Oct. 1957, p. HT97-HT100.

(J-general; TS)

117-J. (German.) **Salt Bath Hardening.** H. Adomeit. *Industrieblatt*, v. 57, Dec. 1957, p. HT117-HT119.

(J2j)

118-J. (German.) **Increase of Durability of Tools by Nitriding.** R. Topp. *Industrieblatt*, v. 3, Dec. 1957, p. HT119-HT124.

(J28k; TS)

119-J. (German.) **Automation in Hardening.** Wilhelm Inden. *Industrieblatt*, v. 57, Oct. 1957, p. 477-479.

Electric rail conveyor system effects savings in gear hardening operation. (J2g, T7a, W12r)

120-J. (German.) **Investigation of Tempering Procedure of Low Alloy Toolsteels With 1% C.** H. Krainer, K. Ebner, E. Krainer and M. Storek. *Radex Rundschau*, no. 5-6, 1957, p. 803-831.

55 ref. (J29; TS)

121-J. (Russian.) **Development of the Theory of Heat Treatment of Steel by Soviet Scientists.** V. D. Sadovskii. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 2-14.

(J-general, N8; ST)

122-J.* (Russian.) **Surface Hardening of Titanium Treated in Fluxed Borax.** A. N. Minkevich and Y. N. Shul'ga. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 53-61.

With electrochemical protection it is possible to treat Ti in fluxed borax. Hardness of the surface was

(*)Articles Available Through Photocopy Service; See Coupon, p. 6

doubled or tripled. Ti is heated to 900-930° C. for 3 hr. at a current density of about 0.1 amp. per sq. cm. Longer exposure results in brittleness and undesirable mechanical characteristics. (J28; Ti, NM-a33)

123-J. (Russian.) **Optimum Temperature of Hardening Cold Worked Steel No. 1X18N9T.** T. N. Rafalovich. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 69-72.

6 ref. (J28, 2-61; ST)

124-J.* **Furnace Atmospheres From Liquids.** I. L. S. Golding. *Metallurgia*, v. 57, Jan. 1958, p. 23-25.

Carburization of iron using alcohol and alcohol-water as the source of carbon. (J28, J2k; ST)

125-J.* **Steam Atmosphere Heat Treating. A New Approach to Scale-Free Heat Treating.** F. L. Spangler. *Steel Processing and Conversion*, v. 44, Jan. 1958, p. 35-37.

Coating and heat treating of various plumbing and machine parts made from copper and steel alloys by means of steam atmosphere. In many cases, steam treating of brasses and bronzes eliminates pickling and the surface cleaning operations. (J2k; Cu, ST, RM-g32)

126-J. The Metallographic View. Pt. 44. Importance of Multiple Tempering of High Speed Steels. R. F. Harvey. *Steel Processing and Conversion*, v. 44, Mar. 1958, p. 150-151.

(J29, N8a, Q29n, 2-14, TS-m)

127-J. (English.) **Annealing Characteristics of 24S and 61S Alloys.** Rihei Kawachi. *Light Metals (Tokyo)*, v. 8, Jan. 1958, p. 78-87.

(J23, N7, M27, 2-60; Al, *Mn, Cr*)

128-J.* (Czech.) **Effect of Nitriding on the Internal Damping of Steel.** Josef Vodsed'alek and Rudolf Stefec. *Hutnické Listy*, v. 13, Jan. 1958, p. 9-14.

Characteristic phenomena that manifest themselves during nitriding include interval tension and structural changes in the damping variations. In nitrided parts, especially in austenitic steels, it is possible to expect damping changes. Nitriding is usually accompanied by a slight decrease of damping during bending and torsion stresses, exceeded by a simultaneous increase of fatigue stress. 15 ref. (J28k, Q22; ST)

129-J. (German.) **Oxidation-Free Heat Treatment in Lithium Atmosphere.** F. Neuberger, etc. *Fertigungstechnik*, v. 7, Oct. 1957, p. 453-455, 471.

Lithium vapor atmospheres inhibits scale formation and decarburization through protective film formed on metal surface. Equipment and processing results of laboratory and plant experimentation. Advantages in better surface quality and reduced cleaning costs. 10 ref. (J2k; *Li*)

130-J. (German.) **Automation in High-Frequency Heat Treatment.** W. Lück. *Fertigungstechnik*, v. 7, Oct. 1957, p. 456-460.

Principles, construction, application and operation of equipment. (J2g, W27k, 18-74)

131-J. (German.) **Heat Treatment of Steels Used in the Fabrication of Pressure Casting Dies.** Karl Schönert. *Giesserei*, v. 45, Mar. 13, 1958, p. 133-139.

General behavior in the hardening process; stress-relieving annealing; hardness testing. 4 ref. (J26, J1a, W19n)

132-J. (German.) **Modern Equipment for Protective Furnace Atmospheres.** A. Hohmann. *Giesserei-Praxis*, v. 75, Nov. 25, 1957, p. 499-500.

Equipment and processing with city gas, natural gas and lithium vapor; desulphurization. (J2k, W27n)

133-J. (Japanese.) **Annealing of an Extruded Aluminum Rod.** Yoshikazu Hosoi, Mamoru Yukawa and Eiichi Sawato. *Light Metals (Tokyo)*, v. 8, Jan. 1958, p. 33-38.

Preheating of the cast billet gave the extruded rod properties similar to extrusions made at higher temperature. Comparison of annealed and stretched rods. 6 ref. (J23, F21b, F24, 4-55; Al)

134-J.* **Molten Metals and Alloys as Heat Treating Media for Steel Components.** A. P. Garashchenko, A. P. Gulyaev and Z. S. Luneva. *Metallovedenie i Obrabotka Metallov*, Jan. 1958, p. 21-26. (Henry Brutcher, Altadena, Calif., Translation no. 4119.)

Al-Si alloy recommended as heating medium for local heat treatment of steel parts. The alloy containing 8-12% Si is suitable for tempering and the alloy containing 6-10% Si and 5-7% Fe can be used for annealing. Both alloys are equal in performance to Pb without the hazards of the latter. Means of protection of crucibles, thermocouples and treated parts as well as ways to minimize handling losses of the alloys. (J2j; ST, Al)

135-J. Establishing Heating Schedules for Steel Parts Taking Into Consideration Thickness of the Mill Scale, Depth of Decarburization and Grain Size. I. F. Golovnev. *Metallovedenie i Obrabotka Metallov*, Jan. 1958, p. 49-55. (Henry Brutcher, Altadena, Calif., Translation no. 4126.)

Graphs of heat treatment of steel components showing optimum conditions with minimum formation of surface defects due to scale, surface decarburization and grain growth. 7 ref. (J-general; ST, 9-71)

136-J.* (German.) **Influence of Gas and Salt Bath Nitriding on Properties of Structural Steels. Pt. 1.** H. Wiegand and M. Koch. *Metalloberfläche*, v. 12, Mar. 1958, p. 69-74.

Mechanism and technique of nitriding; structure of nitride layer; influence of temperature and method on nitriding process; strength of steel after nitriding; influence of cooling and tempering; metallographic examination. (J28k; ST, SGB-s)

K Assembling and Joining

185-K.* **Bonding Ceramics to Metals.** A. E. Williams. *Industrial Finishing (London)*, v. 10, Jan. 1958, p. 22-26.

Examples of bonds between variety of metals and ceramic materials utilizing adhesives containing silicate rubber or synthetic resin base. (K11b)

186-K. Stress Relief of Weld Layers Assures Quality Repair. *Iron Age*, v. 181, Jan. 30, 1958, p. 98-99.

Stress relieving alternated with arc welding prevents accumulation of residual stresses which might cause cracking in repairing large cast steel crankshafts. (K1a, J1a; ST, 5-60, 18-72)

187-K.* **High Penetration Produces High Strength Brazed Joints.** James W. Maston. *Modern Metals*, v. 14, Feb. 1958, p. 36-39.

Dip brazing of Al allows easier fabrication of complex parts which would normally require precision casting and machining. (K8n; Al)

188-K.* **How to Weld Copper and Its Alloys. Pt. 2.** Lester F. Spencer. *Steel*, v. 142, Feb. 24, 1958, p. 90-98.

Recommendations for metallic arc welding of copper, brass, silicon bronze, phosphor bronze and aluminum bronze; preferred techniques, electrode, pretreatment and joint design. (K1, Cu)

189-K. Equipment for Welding Reactive Metals. A. Mombrun and W. G. Hull. *Welding and Metal Fabrication*, v. 26, Jan. 1958, p. 9-11.

Vacuum welding chamber for tungsten inert-gas-shielded welding of Ti, Zr, Cb, Ta or V-base alloys under controlled conditions. (K1d, 1-52, 1-73; Ti, Zr, Cb, Ta, V)

190-K. Portable Spot Welding Equipment. C. W. J. Vernon. *Welding and Metal Fabrication*, v. 26, Jan. 1958, p. 12-18.

5 ref. (K3n, 1-52)

191-K. A New Brazing Technique. Charles E. Rorick. *Welding and Metal Fabrication*, v. 26, Jan. 1958, p. 19-21.

Brazing of 17-7PH stainless steel honeycomb panels with Ag-Mn alloy in new graphite brazing fixtures at Convair. (K8, Ag, Mn, SS, 7-59)

192-K.* **Inert-Gas Tungsten-Arc Welding SAE 4130 Steel Sheet. Pt. 3. Effects of Welding Speed on Cracking.** C. A. Terry and W. T. Tyler. *Welding and Metal Fabrication*, v. 26, Jan. 1958, p. 24-31.

Assessed by radiographic and visual examinations, the effect of welding speed varying from 4 to 22 in. per min. on number and length of transverse cracks occurring in 0.055 and 0.104-in. thick welded sheet. Data obtained from metallographic examination, microhardness and macrohardness tests of welds formed at various speeds and patch and Pellini hot cracking tests indicate that cracking encountered occurred at or near solidus temperature. 4 ref. (K1d, 3-67; AY, 4-53, 9-72)

193-K.* **Welding Certain Heat and Corrosion-Resistant Alloys. Some Practical Aspects Reviewed.** R. C. Perriton and R. T. Phillips. *Welding and Metal Fabrication*, v. 26, Mar. 1958, p. 98-102.

Welding techniques for Hastelloy alloys B, C, F and X; Multimet alloy (N155) and Multimet No. 25, to avoid poor bend contour, flux pockets, porosity, overheating and microfissuring. (K-general; Ni, Co, SGA-g, SGA-h)

194-K.* **Inert-Gas Tungsten-Arc Welding SAE 4130 Steel Sheet. Pt. 5. Mechanism of Hot Cracking.** C. A. Terry and W. T. Tyler. *Welding and Metal Fabrication*, v. 26, Mar. 1958, p. 103-110.

Transverse cracks probably occur at temperatures above the solidus, arising from interaction between effects due to metastability and construction. The extent of cracking is a function of welding speed and is increased by the presence of pearlite-ferrite banding and other microstructural features. 17 ref. (K1d; AY, 4-53, 9-72)

195-K. Kaiser's 3 New Mig Techniques for Welding Aluminum. *Welding Engineer*, v. 43, Mar. 1958, p. 36-38.

To eliminate porosity and dross in welding Al, two new processes using argon or helium plus chlorine in the contact tube, with conventional gases in the nozzle, have been developed. A third method utilizes nitrogen in the gas nozzle, and argon or helium plus nitrogen in the contact tube. (K1d; Al)

196-K. Flux in Flame Finds Greater Applications. E. H. Conway. *Welding Engineer*, v. 43, Mar. 1958, p. 40-42.

In this brazing process, flux is held in solutions in a highly volatile, flammable liquid and fed to the torch tip in regulated amounts. Excessive fluxing is avoided, yet brazing surfaces are protected against oxidation. (K8g)

197-K.* Fusion Welding of Uranium. E. L. Brundige, Denton T. Doll, Gale S. Hanks and James M. Taub. Paper from "Nuclear Metallurgy", v. 4, AIME, p. 107-115.

Techniques for producing sound welds with uranium sheet, plate and shapes using inert-gas tungsten-arc process. Microstructure and mechanical properties of welds; other welding techniques. (K1d; U)

198-K. (Dutch.) **Vertical Welding Without Preliminary Processing.** A. J. v. d. Velde. *Lastechniek*, v. 24, Feb. 1958, p. 17-19.

In arc welding with normal electrodes the edges of the workpieces have to be given special shaping. In a modified process of vertical welding two welders work simultaneously and the preliminary processing can often be omitted. (K1)

199-K. (French.) **Electric Welding.** *L'Electricien*, v. 86, Jan. 1958, p. 6-9.

Generalities; power supply, technique of arc welding; use of metal electrodes; arc formation. (To be continued.) (K1)

200-K. (German.) **Welding Gray Iron With Small Heat Consumption.** G. M. Blanc. *Industrie Anzeiger*, v. 79, Aug. 16, 1957, p. 990-993.

(K-general; CI-n)

201-K. (German.) **New Experiment With Cold Pressure Welding and Cold Pressure Soldering.** Wilhelm Hofmann. *Industrie-Anzeiger*, v. 79, Nov. 15, 1957, p. 1435-1439.

This technique makes it possible to weld Al and Pb, and to solder iron and Pb. 13 ref.
(K6, K7; Al, Fe, Pb)

202-K.* (German.) **Welding of Heat Resisting Steels.** H. H. Weigand. *Schweissen und Schneiden*, v. 10, Feb. 1958, p. 44-49.

Welding of heat resisting austenitic steels is performed mostly by means of similar filler materials. Most favorable results result from arc welding with basic coated electrodes. Heat treatment of weld seam improves its quality. Hot cracking is promoted by sulphur, phosphorus and silicon and reduced by small amounts of carbon, manganese and ferrite. (K1, K9; SS, 9-72)

203-K.* (German.) **Experimental Analysis of the Joining Process in Soldering.** J. Colbus. *Schweissen und Schneiden*, v. 10, Feb. 1958, p. 50-54.

Mechanism of joining; temperature measurements in soldering; joints of the same parent and filler metals; tensile strength testing. Optimum joints demand a liquid layer between solder and parent metal. Minimal temperature at which a joint can be effected varies with different metals. (K7)

204-K. (German.) **Inert-Gas Tungsten-Arc Welding of Sheet Steel for Transformers and Dynamos.** J. Ruge and W. Rauchfuss. *Schweissen und Schneiden*, v. 10, Feb. 1958, p. 55-58.

(K1d, W11q, W11r, 17-57; ST, SGA-n, 4-53)

205-K. (German.) **Testing Materials in Welding.** M. Pfender. *Schweisstechnik*, v. 11, Nov. 1957, p. 121-135.

Composition and structure of materials, chemical and mechanical properties, resistance to the effect of attacking media; possibility of modifying the materials, new materials and combinations, necessity of developing methods and tools; importance of standards; problems of brittle fracture and vibration. 36 ref. (K9r)

206-K. (German.) **Basic Lime Coated Electrodes for High-Quality Welding.** Alfred Schmidt. *Schweisstechnik*, v. 11, Dec. 1957, p. 143-150.

Various types of lime coated electrodes. Welding techniques and applications. (K1a, W29h)

207-K.* Semi-Automatic Welding. Robert N. Williams and Herb Hinkel. *Industry and Welding*, v. 31, Apr. 1958, p. 48-51, 108-109.

Three processes use flux to shield the weld puddle: Unionarc uses a continuously fed wire electrode that is magnetically coated with flux and shielded by a flow of CO_2; dual shield, a continuous flux-cored electrode, is fed through gun equipment to the welding arc; mechanized squirt welder controls wire feed, flux flow and travel. Four processes use gas shielding: Wes-ing-Gun, a portable gas-shielded gun; Migarc, a gas-shielded welder; C-O manual uses CO_2 on mild steel to speed travel; Aircomatic uses same control box with one of three wire feeders and one of four guns. (K1d; 1-52)

208-K. Three Ways to Weld Aluminum Without Porosity. *Industry and Welding*, v. 31, Apr. 1958, p. 56, 80.

Three processes, Qualiweld, Econoweld and Chlorecon, involve addition of chlorine or nitrogen to the shielding gas. (K1d, K9, 2-60; Al)

209-K. Progress in the Joining of Aluminum. N. T. Burgess. *Metallurgia*, v. 57, Mar. 1958, p. 117-121.

Capabilities and limitations of various methods of joining Al. 9 ref. (K-general; Al)

210-K.* Brazing Salvages Cracked Stampings. E. H. Conway. *Steel*, v. 142, Mar. 3, 1958, p. 110-115.

Three procedures are necessary to make the technique work: peening to form V-shape depression the full length of crack, employing flame fluxing process which prevents oxidation of the surface and cleaning problem, and brazing with Ni-Ag filler rod. (K8; ST, 4-59)

211-K. Practical Application of Inert-Gas Metal-Arc Welding to Some Aluminum Alloys. E. M. Wilson. *Welding and Metal Fabrication*, v. 25, Dec. 1957, p. 474-481.

(K1d; Al)

212-K.* Dip Brazing of Magnesium —Possible, Practical and Efficient. William J. Graves. Paper from "Magnesium in Perspective", Magnesium Association, p. 400-403.

Dip brazing requires thorough prior cleaning and deburring. The joints show no cracks, little porosity under X-ray examination. Ultimate tensile strength drops about 10% due to heating; corrosion resistance equal to or better than similar welded items. (K8n; Mg)

213-K.* Workable Method for Continuous Welding of Magnesium Proves Highly Efficient. Ray Miles. Paper from "Magnesium in Perspective", Magnesium Association, p. 1500-1506.

Consumable electrode argon-arc welding, at speeds up to 80 in. per min., produces sound welds, with only minor "burn back" problems. (K1d; Mg)

214-K. (German.) **Brazing Hard Metals on Steel.** E. Luder, etc. *Fertigungstechnik*, v. 7, Oct. 1957, p. 449-452.

Pure Cu brazing metal with 2% ferrosilicon (45% Si) and borax flux at a furnace temperature of 1100-1200° C. gives a strong bond between the overlapping surfaces. The process, surface alloying conditions, Vickers hardness values of joint areas, results of microscopic examination. 8 ref. (K8; ST, SGB-q, Cu)

215-K.* (German.) **Influence of Hydrogen on Chemical Composition and Structure of Steel. Weldability of Killed and Rimming Carbon Steel.** Friedrich Erdmann-Jesnitzer and Paul Dammkohler. *Neue Hütte*, v. 2, Oct. 1957, p. 637-645.

Results of test welding; strength after cold bending; immersed arc welding; porosity; electrode evaluation. 25 ref.
(K9s, 2-60, 3-71; ST-c, ST-d, *H*)

216-K. (German.) **Effect of a Second Cutting Operation on the Stress Distribution in Shrink Fit Constructions.** H. Bühler and W. Schepp. *Werkstatt und Betrieb*, v. 91, Mar. 1958, p. 141-145.

Mathematical calculation of change in inherent stress and contact pressure. 12 ref. (K13r, Q25, G17)

217-K.* (German.) **Cold Pressure Welding and Brazing.** F. C. Fritz. *Werkstoffe und Korrosion*, v. 9, Jan. 1958, p. 4-7.

Lap brazing is rarely applied; butt brazing is used at places impossible to weld. Necessary tools and quality of the welds; historical discussion. 5 ref. (K5, K8)

218-K.* Dual Fixturing Boosts Brazing Rate. W. E. Atkinson. *Iron Age*, v. 181, no. 6, Feb. 6, 1958, p. 100-101.

Study of brazing line shows that duplicate fixtures at each induction machine will increase output of bicycle frames. Each operator can load a fixture while brazing is in progress in the duplicate one—this more than doubles production. (K8k)

219-K. Machine Soldering Cuts Costs, Doubles Small Shop's Output. Robert Mortensen. *Iron Age*, v. 181, Mar. 27, 1958, p. 100-101.

(K7, T10d; Cu-a, Cu-n)

220-K. How and Where to Use Shielding Gases for Welding. O. T. Barnett. *Iron Age*, v. 181, Apr. 10, 1958, p. 91-98.

(K1d)

221-K. Resistance Welding Joins Swing to Automation. R. H. Eshelman. *Iron Age*, v. 181, Apr. 10, 1958, p. 99-103.

(K3, 18-74)

222-K. Dip Brazing of Aluminum. James W. Maston. *Light Metal Age*, v. 16, Feb. 1958, p. 8-11.

(K8n; Al)

223-K. Welding in the Construction of High Vacuum Equipment. *Welder*, v. 26, Oct-Dec. 1957, p. 94-98.

(K-general, W-general, 1-73)

224-K. Welding Steam Generator Pipes at Marchwood Power Station.

J. W. Kocaba. *Welder*, v. 26, Oct-Dec. 1958, p. 99-102.
(K-general, W11g, W11k; 4-60)

225-K. **Spotlight on Arc Welding.** *Welder*, v. 26, Oct-Dec. 1957, p. 103-107.
(K1)

226-K. **Nonuniformity in the Area of Welded Seams.** L. S. Livshits, L. P. Bakhrakh and S. I. Panich. *Metallovedenie i Obrabotka Metallov*, Jan. 1958, p. 26-29. (Henry Brutcher, Altadena, Calif., Translation no. 4120.)
4 ref. (K9)

227-K. (English.) **Manual Arc Welding of Stainless and Heat Resisting Steels and Alloys With Fusible Electrodes.** *Aciers Fins & Speciaux*, no. 27, Dec. 1957, p. 106-110.
(K1a; SS)

Cleaning Coating and Finishing

238-L. **Plastic-Coated Steel.** *Automobile Engineer*, v. 48, Jan. 1958, p. 17-18.
(L26p; ST)

239-L. **Corrosion Prevention at the Stern Areas of H. M. Ships.** J. C. Kingcome. *Corrosion Prevention and Control*, v. 4, Dec. 1957, p. 35-40.
Reinforced epoxy resin coatings for propeller shafts and neoprene for rudders and stern brackets have proved generally satisfactory.
(L26p, R4b, T22)

240-L. **Electroplating of Screws and Other Small Parts. Pt. 2.** Werner Peters. *Draht (English Edition)*, no. 32, Dec. 1957, p. 31-42.
Modern electroplating equipment and high-efficiency electrolytes. (To be continued.) (L17, 1-52, T7f)

241-L. **Compressed Air and Its Application in Metal Finishing.** James Robertson. *Electroplating and Metal Finishing*, v. 11, Jan. 1958, p. 3-8, 14.
Metal spraying. 5 ref. (L23)

242-L.* **Selection and Use of Phosphate Coatings as Pretreatments for Organic Finishes.** R. F. Drysdale. *Electroplating and Metal Finishing*, v. 11, Jan. 1958, p. 9-14.
Characteristics of phosphate coatings including crystal size, free pore area, thickness, weight, corrosive residues, resistance to deformation; function of the coating in preventing corrosion and promoting adhesion of the organic finish. (To be concluded.) (L14b, L26)

243-L.* **Some Aspects of Cleaning Prior to Metal Finishing.** Bruce Whitehead. *Electroplating and Metal Finishing*, v. 11, Feb. 1958, p. 35-42.
Types of soil, degree of cleanliness required, cleaning methods, including the use of blasting, barrelling, acid solvents, alkaline cleaners, emulsion cleaners, chlorinated hydrocarbons and fused salt baths; methods of agitation in cleaning, equipment and materials for ultrasonic cleaning. 6 ref. (L10, L12)

244-L. **Survey of Abrasion-Resistance Tests for Vitreous Enamels.** J. A. Clarke. *Foundry Trade Journal*, v. 104, Feb. 13, 1958, p. 179-183.
Attempts to establish a standard scratch-resistance test for vitreous enamels. No pratcical method of doing so has yet been found.
(L27, Q9n)

245-L. **Flow Coating Setup for Painting Structural Steel.** E. A. Moenning. *Industrial Finishing*, v. 34, Feb. 1958, p. 26-30.
(L26n; ST)

246-L. **New Finishing Setup for Steel Office Furniture.** *Industrial Finishing*, v. 34, Feb. 1958, p. 54-56.
(L-general; ST)

247-L. **Non-Yellowing Lacquer Protects Outside Aluminum Products.** *Industrial Finishing*, v. 34, Feb. 1958, p. 58-60.
(L26n, Al)

248-L. **Painting Steel Pails.** H. L. Cerniak. *Industrial Finishing*, v. 34, Feb. 1958, p. 62-64.
(L26n; ST)

249-L. **Painting Rough Metal and Castings.** Karl F. Schreiber. *Industrial Finishing*, v. 34, Feb. 1958, p. 94-98.
Crinkle finishes and hammer-effect enamels for coating rough metals; preventing blisters in baked enamel applied over Al and Mg castings.
(L26n; Al, Mg, Zn, 5-60, 8-71)

250-L. **Epoxide Resins in Anti-Corrosion Finishes.** Frank L. Farr. *Industrial Finishing (London)*, v. 9, Dec. 1957, p. 986-991.
(L26p)

251-L.* **Porous Chroming.** R. Josse and N. Manson. *Industrial Finishing (London)*, v. 9, Dec. 1957, p. 1004-1006.
Historical development, methods of pretreatment, suitable metals and techniques of producing porous Cr in cylinders of airplane and other engines. (To be concluded.)
(L17; *Cr*)

252-L.* **Radiometric Study of the Iron Phosphating Process.** S. L. Eisler and Jodie Doss. *Industrial Finishing (London)*, v. 9, Dec. 1957, p. 1008-1012.
SAE 1020 steel test coupons phosphated by spraying with or immersion in phosphate solutions. Radioactive phosphorus-32 employed to determine percentage of iron phosphate in coatings produced with different methods and solutions.
(L14b, 1-59; CN)

253-L. **Silicone Based Paints for Industrial Finishing.** *Industrial Finishing (London)*, v. 10, Feb. 1958, p. 26-29.
(L26p)

254-L. **High Temperature Coatings.** Alfred F. Hofstatter. *Industrial Finishing (London)*, v. 10, Feb. 1958, p. 34-36.
(L-general; SGA-h)

255-L. **Processing and Finishing Zinc-Coated Sheet.** *Industrial Finishing (London)*, v. 10, Feb. 1958, p. 41.
(L17, 4-53; ST, *Zn*)

256-L. **Vacuum Deposition Avoids Embrittlement.** V. Dress. *Iron Age*, v. 180, Dec. 19, 1957, p. 142-145.
Cadmium coatings on steel aircraft parts do not develop hydrogen embrittlement but meet all military specifications for adherence, corrosion resistance, coating thickness and uniformity.
(L25g, Q26s; ST, *Cd*)

257-L.* **Glass Coatings. A Good Way to Protect Metals.** Charles E. Bullock and Forest Nelson. *Materials in Design Engineering*, v. 47, Mar. 1958, p. 106-109.
Chemical and physical properties, performance capabilities and design factors in the use of new glass coatings. (L27; NM-f42)

258-L.* **Spray Cleaning, Pickling and Phosphating.** A. J. Steiger. *Metal Finishing*, v. 56, Mar. 1958, p. 48-51.
Spray-jet methods, combining mechanical and chemical action, are used for cleaning, pickling and rust-proofing metal parts in Russian auto, tractor and farm machinery factories. Advantages include higher productivity, shorter treatment time and improved quality.
(L12, L14b)

259-L.* **Chemical Polishing.** Lester F. Spencer. *Metal Finishing*, v. 56, Mar. 1958, p. 52-56.
Probable mechanism of chemical polishing; relationship between it and bright dipping. In the Battelle process, a phosphoric-nitric-acetic acid mixture is used for polishing alpha brass and high-nickel alloys. Some disadvantages of this method can be overcome by substituting hydrochloric for nitric acid and using certain other additives. Mechanical polishing is frequently used to condition surfaces prior to chemical polishing. (L12)

260-L.* **Hot Grit Blasting Improves Phosphate Coatings.** Jacob Knanishu. *Metal Finishing*, v. 56, Mar. 1958, p. 57-62.
Panels of 1020 cold rolled steel were tested, using a salt spray, for corrosion resistance by grit blasting and phosphate coating. Blasting improved corrosion resistance only slightly. When similar panels were also painted with a styrenated phthalic alkyl enamel, grit-blasted panels showed markedly improved resistance. (L10c, L14b; CN)

261-L. **Electropolishing Copper, Brass and Aluminum.** K. F. Lorking. *Metal Finishing*, v. 56, Mar. 1958, p. 64, 68.
(L13; Cu, Al, Cu-n)

262-L. **Flexibility and Labor Reduction Feature New Plating Department.** Donald A. Sigman. *Metal Finishing*, v. 56, Mar. 1958, p. 65-68.
Semi-automatic nickel-plating installation featuring a common cleaning cycle, any selected plating combination and a common drying cycle. Plating and cleaning times may be varied independently. (L17; Ni)

263-L. **Finishing Pointers. Strike Cleaning.** J. B. Mohler. *Metal Finishing*, v. 56, Mar. 1958, p. 69.
(L12k, L13n, L17)

264-L.* **Descaling of Titanium.** W. B. Stephenson, Jr. *Metal Progress*, v. 73, Mar. 1958, p. 87-89.
A hot solution of sulphuric acid and calcium fluoride, followed by nitric-hydrofluoric acid, gives a bright surface, free from pits. Such treatment does not endanger formability. (L12g, Q23q, Q5; Ti)

265-L.* **Which Coating at High Temperature?** Gordon D. Oxx, Jr. *Product Engineering*, v. 29, Jan. 20, 1958, p. 61-63.
For use above 1000° F., protective coatings should control oxidation of the base metal, prevent erosion and be compatible with the base metal. Good resistance to oxidation is found in the noble metals and the ceramics, which are brittle under high stress or impact loading. Protective scale formation is promoted by about 20% Cr in the stainless steels, cobalt-base superalloys and nichrome, or Al or Cr-Al. Chart of typical coating compositions; Ni and Ni-base alloys on Mo, Cr on 18-8 stainless, alumina on alloys of iron, Ni, Mo, Co. (L-general, R1h; SGA-h)

266-L.* **Porcelain Coatings on Steel.** L. E. Fussell and H. P. Tripp. *Product Engineering*, v. 29, Feb. 17, 1958, p. 75-77.
Advantages of enameling cold

rolled steel and firing at 1200 to 1400° F. Compares coating properties with enamels fired at conventional temperatures. Cause and correction of coating defects. (L27; ST)

267-L.* Bright Nickel Plating. Pt. 1. Basic Solutions. D. J. Fishlock. *Product Finishing*, v. 11, Jan. 1958, p. 48-62.

Origins and evolution of bright Ni solution; modified Watts-type solutions; effect of variety of addition agents on brightness. 35 ref. (L17a; Ni)

268-L. Influence of Mica on Impact Resistance Stoving Finishes. H. W. Chatfield. *Product Finishing*, v. 11, Jan. 1958, p. 70-73.

Use of ground mica for improving adhesion or for adsorbing or distributing internal stresses in a coating. (L26p, Q6n)

269-L. Production Buffing With Liquid Compositions. Pt. 2. H. L. Kellner. *Product Finishing*, v. 11, Jan. 1958, p. 74-77.

Factors controlling metal removal by buffing where liquid compound is sprayed on buffing wheel. (L10a)

270-L. Fabricating Continuous Galvanized Steel. Pt. 2. Tips on Using a Product With Wide Applications. Ernest W. Horvick. *Steel Processing and Conversion*, v. 44, Feb. 1958, p. 92-94, 103, 104.

(L16, Q23q; ST)

271-L. (French.) **Phosphation With Iron Phosphate.** M. J. Demesse. *Corrosion et Anti-Corosion*, v. 6, Feb. 1958, p. 37-39.

(L14b)

272-L.* (French.) **Some New Ideas on the Protection of Magnesium-Base Alloys.** W. F. Higgins. *Corrosion et Anti-Corrosion*, v. 6, Feb. 1958, p. 40-43.

Anodic treatment in acid ammonium fluoride insures cleanness and passivation of alloy surface; prefinishing with special resin, Araldite 985E, provides undercoating of high impermeability, adherence and flexibility as base for protective paint. Chemical passivation following anodic treatment is recommended for parts destined for severe service conditions, and is obligatory in Great Britain for aeronautical components in magnesium-base alloys. (L19, R10c; Mg)

273-L. (French.) **Chemical Treatments for Aluminum and Alloys as a Protection Against Oxidation or as a Preparatory Step Before Painting.** Claude Hess. *Corrosion et Anti-Corrosion*, v. 6, Feb. 1958, p. 44-47.

4 ref. (L14b, L14c, L19; Al)

274-L.* (French.) **Industrialization of Chemical Nickel Plating.** R. Bailleul. *Corrosion et Anti-Corrosion*, v. 6, Feb. 1958, p. 48-50.

Principle of chemical nickel plating; technology; properties of deposits; applications of process. (L28; Ni)

275-L.* (French.) **Variations in Density of Phosphate Coatings on Iron and in Their Protective Value as a Function of Duration of Coating Process.** Emilio Jimeno and Antonio Arevalo. *Corrosion et Anti-Corrosion*, v. 6, Feb. 1958, p. 51-58.

Study showed that thickness of coatings is not a simple function of duration of treatment. Phenomena of partial redissolution and regrouping occur in phosphated layer concomitant with changes in grain size, and these changes affect protective power of coating. 10 ref. (L14b; Fe)

276-L. (French.) **Painting of Hot Galvanized Steel.** J. F. H. Van Eijnsbergen. *Peintures, Pigments, Vernis*, v. 34, Jan. 1958, p. 5-9.

15 ref. (L26n, 2-62; ST, Zn, 8-65)

277-L. (German.) **Protecting Steel Screws From Corrosion.** G. Becker. *Draht*, v. 9, Jan. 1958, p. 13-15.

Chromium diffusion coatings produced by "Inkrom" method. (L15, T7f; ST, *Cr*)

278-L.* (German.) **Sand Blast Cleaning.** H. Koeller. *Giesserei-Praxis*, no. 2, Jan. 25, 1958, p. 28-34.

Short review of different techniques and systems. Methods of dust removal; cleaning agents. (L10c, A8a; NM-f45)

279-L. (German.) **Containers and Tubes With Lead Protective Coatings.** M. Reinert. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 6-11.

Technology of electrolytic lead coating and of sheet-lead linings. 3 ref. (L17, L22, W12c; 4-60; *Pb*)

280-L. (German.) **Fire Sprayed Metal Coatings as Corrosion Protection.** T. Hoffmann. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 12-14.

Zinc, aluminum and lead flame sprayed coatings for protection of steel. 9 ref. (L23; ST, *Al, Pb, Zn*)

281-L. (German.) **Rubberizing of Tubes and Containers.** H. Germar. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 15-18.

(L26r, W12c, 4-60)

282-L. (German.) **Plastic Coatings for Tubes and Containers.** L. Benker. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 18-22.

(L26p, W12c, 4-60)

283-L. (German.) **Flame Sprayed and Sintered Plastic Coatings.** E. Gemmer. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 22-25.

(L26p, 4-60)

284-L. (German.) **Protection of Tubes and Containers With Lacquer.** K. H. Hauck. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 26-28.

Practical factors to be considered in lacquering for storage. (L26n, W12c, 4-60)

285-L. (German.) **Protection of Tubes and Containers With Plastic Dispersions.** H. Groebler. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 28-34.

Method of dispersion coating with high and low-pressure polyethylene, "Teflon" and "Hostaflon". (L26p, W12c, 4-60)

286-L. (German.) **Enamel Coating of Tubes and Containers.** A. Schwab. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 35-37.

Adhesion to steel, quality control, application, testing and behavior on heat shock. 12 ref. (L27, W12c, 4-60; ST)

287-L.* (Spanish.) **Accelerators in Cold Phosphating.** Lamberto A. Rubio Felipe. *Instituto del Hierro y del Acero*, v. 10, Oct-Dec. 1957, p. 441-453.

Study of cold phosphate coating of a mild commercial steel and an electric steel, both of low carbon content. Influence of nature of material treated, phosphate concentration in bath and pH. Effect of organic and inorganic accelerators on thickness of coating and grain size of deposits. (L14b, 1-67; CN-g)

288-L. Improved Coatings for the Protection of Water-Sealed Gas Holders. *Corrosion Prevention and Control*, v. 5, Feb. 1958, p. 44-46.

Protective system provided a primer based on Zn and "Epikote" resin to give solvent resistance and anti-corrosive properties, with the top coat of a catalyzed pure "Epikote" resin-based enamel to consolidate the solvent and chemical resistance. (L27)

289-L. Flame Spraying of Metals. D. E. J. Cunningham. *Corrosion Technology*, v. 5, Mar. 1958, p. 71-74.

Technique whereby a metallizing pistol passes metal in the form of powder or wire through the center of an oxy-fuel gas flame, where it is melted, picked up by a stream of air at high velocity and propelled on to a suitably prepared surface to form a coating. (L23, R-general)

290-L. Low Cost Hard-Facing by Spraying. J. R. Franklin. *Corrosion Technology*, v. 5, Mar. 1958, p. 75-76.

(L23)

291-L. 'Serseal' — Development in Fume Prevention. R. E. Shaw. *Corrosion Technology*, v. 5, Mar. 1958, p. 79-80.

Sealing layer technique applied to Granodine phosphate treatment minimizes steam evolution and condensation and lowers gas consumption. (L14b, A8a)

292-L.* Bright Anodizing by the Modified Erftwerk Process. R. Peek and A. W. Brace. *Electroplating and Metal Finishing*, v. 11, Mar. 1958, p. 71-76.

A modification of the Erftwerk process for the chemical brightening of commercially pure Al extends the optimum brightness range. Effects of inhibitors, lead content and operating temperatures. 7 ref. (L19; Al-a)

293-L. A.R.D.E. Chemical Smoothing Process for Steel. Some Recent Applications. *Electroplating and Metal Finishing*, v. 11, Mar. 1958, p. 82-83.

3 ref. (L12g, G24b; ST)

294-L.* Amino Acid Cadmium Plating Solutions for Ultra High Strength Steel. P. N. Vlannes, S. W. Strauss and B. F. Brown. *Electroplating and Metal Finishing*, v. 11, Mar. 1958, p. 85-87.

Various amino acid complexing agents added to cadmium plating solutions resulted in better deposition and reduction of hydrogen embrittlement. (L17a; ST, *Cd*)

295-L. Porous Chroming. Pt. 2. *Industrial Finishing (London)*, v. 10, Jan. 1958, p. 47-50.

Deposition of Cr on engine cylinder walls and development of porosity. Control of adherence, hardness and porosity. (L17; *Cr*, 9-68)

296-L. Metal Treatment of Aircraft. *Industrial Finishing (London)*, v. 10, Mar. 1958, p. 30-33.

I. C. I. Alocrom pretreatment process at Vickers Aircraft. (L12h, T24a, Al)

297-L.* Painting Hot Dip Galvanized Steel. J. F. H. van Eijnsbergen. *Industrial Finishing (London)*, v. 10, Mar. 1958, p. 34-36.

Paints containing around 80% Zn dust and 20% vehicle have long been known for their excellent performance, for example, as coatings for water tanks. The Zn-rich paints for Zn dust compounds give a dry film containing 94-95% Zn dust and only 5-6% of a vehicle which is generally a synthetic resin. (L26n; ST, *Zn*, 8-65)

298-L. Metal Finishing in the Mining Industry. *Industrial Finishing (London)*, v. 10, Mar. 1958, p. 37-39.

(L26p, R-general, T28r)

(*)Articles Available Through Photocopy Service; See Coupon, P

299-L. Mechanized Roll Coating. Thomas A. Dickinson. *Industrial Finishing (London)*, v. 10, Mar. 1958, p. 43-44.

Two electrically rotated coating rolls—horizontally aligned, one over the other—with automatic-feed units make it possible to coat either one or two surfaces of a flat material in a single pass. (L26, 4-53)

300-L.* Pickling, Descaling, and Derusting of Steels. W. Bullough. *Metallurgical Reviews*, v. 2, no. 8, 1957, p. 391-405.

Pickling theory, pickling of mild steel, electrolytic pickling, gas pickling, sodium hydride pickling, disposal of spent pickle liquor, other methods of descaling. 51 ref. (L12; ST)

301-L. Slide-Honing—a New Barrelling Technique. Charles Emerson. *Metalworking Production*, v. 102, Mar. 14, 1958, p. 453-455.

A precision technique which confines parts to sliding and rolling actions that remove stock accurately, without damage. (L10d)

302-L. Organic Finishes Over Metal Surfaces. Myron Perez. *Plating*, v. 45, Mar. 1958, p. 239-244.

Present and potential uses of epoxies, phenolics, acrylics and vinyl dispersion coatings. (L26p)

303-L. Fabricating Continuous Galvanized Steel. Tips on Using a Product With Wide Applications. Ernest W. Horvick. *Steel Processing and Conversion*, v. 44, Jan. 1958, p. 43-46.

Three basic methods of galvanizing are hot dip or "batch" galvanizing, continuous hot dip galvanizing, electro-galvanizing; specifications. (To be continued.) (L16; ST, *Zn*)

304-L. Electrophoretic Deposition of Plutonium. A. Feasibility Study. K. A. Walsh. *U. S. Atomic Energy Commission*, LA-2153, Jan. 1958, 13 p.

(L29p; Pu)

305-L.* Accelerators and Their Function in Phosphating Solutions. Lloyd O. Gilbert. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 73-78.

Acceleration by saturating solution with metals in form of ferrous and Mn salts and with heavy metals in form of Cu and Ni salts. Another method is electrolytic polarization. Compares reactions of nitrate and nitrate-nitrite, depolarizers and metal oxiders, solutions in bath and resulting coatings. 13 ref. (L14b)

306-L.* Latest Development in Electroplating With Ultrasonics. Stanley R. Rich. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 87-90.

Ultrasonics improve and accelerate the plating process. Applications are chiefly in Ni, Zn, Cr and Ag plating. Technique applied to Watts bath, fluoborate bath and a variety of proprietary bright Ni solutions. (L17, 1-74)

307-L.* Barrel Plating. Paul Glab. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 116-120.

Comparison of oblique and horizontal types of barrel plating. Pickling and cleaning, alkaline descaling by immersion and electrolytic process and activating of the metal. Recommended solutions, concentrations and operating conditions for Cd, Zn, Cu, brass, Ni and Fe plating. (L17, W3b, 1-52)

308-L.* Further Studies on Nickel-Iron Alloy Electrodeposits. I. W. Wolf. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 121-123.

Effects of 79% Ni, 21% Fe alloy plating parameters and thickness and use of alloy as a bright protective coating. Grain size and magnetic properties of very thin films. Current density, pH, and grain size as a parameter are poor. Plating was tested with salt spray. Pits and amount of oxide excreted from each pit were less for Ni-Fe coating compared with Ni coating from Watts bath. (L17; *Ni, Fe*)

309-L.* Iridium Plating and Its High Temperature Oxidation Resistance. James C. Withers and Paul E. Ritt. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 124-129.

Use in missiles and aircraft. Iridium plates could protect stainless steel from flaking and scaling and Mo from forming volatile oxide at high temperatures. Most successful conditions were developed using sodium cyanide and potassium cyanide in molten state. Iridium plating (0.0005 in. thick) keeps stainless steel from scaling when exposed for 30 min. at 1000° C. Thicker plates would offer complete protection of Mo at high temperatures. 3 ref. (L17, T24; SS, Mo, *Ir*)

310-L.* Surface Catalyzed Reduction of Copper. A. E. Cahill. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 130-131.

Deposition of thick Cu films by chemical reduction proved unsuccessful with hypophosphite but practical with formaldehyde. Three alkaline Cu tartrate-formaldehyde solutions were found to deposit Cu autocatalytically to produce thick films. Experiments suggest that Cu reduction takes place by the transfer of electrons through the metal film from species existing in the alkaline formaldehyde solution to Cu at another point on the metal surface. There is not always a 1:1 ratio between H_2 and Cu deposited. 4 ref. (L17; *Cu*)

311-L.* Sealing of Sulfuric Acid Anodic Films on Aluminum. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 132-142.

Methods included water sealing at various pH values and sealing times, steam sealing at atmospheric and 15 psi. in dichromate, molybdate, nickel acetate and silicone solutions. Molybdate seals with colorless coating and may be useful method. Extent of sealing was rated by weight gain on sealing, weight loss on immersion in cold sulphuric acid solution, cathodic current flow and resistance to acidified salt spray and outdoor exposure. 38 ref. (L19; Al)

312-L.* Role of Chromate Treatments in the Finishing of Aluminum. Walter E. Pocock. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 152-155.

Chromate treatment can often be substituted for anodizing. It requires no electrical current, short time for processing, no venting for tank, and operates at room temperature. Coating can be applied by immersion, brush or spray; dimensional change is negligible; control of bath is relatively simple. 5 ref. (L14c; Al)

313-L.* (English.) **Study of the Anode Area in Electrolytic Polishing of Copper.** Masao Naruse and Akira Nannichi. *Tohoku University, Technology Reports*, v. 22 no. 1, 1957, p. 29-39.

Consideration should be given to positional arrangement of the cathode, uniform distribution of current, cathode surface area. Bubbling during electropolishing, electrolyte convection and potential distribution in the cell should influence pole distance. If cathode area is too small, surface finish on the anode is unsatisfactory. With unchanged cell voltage, if the anode area decreases, the current density increases, and decreases as anode area and pole distance become greater. (L13p; Cu)

314-L.* (French.) **Recent Developments in Anodic Oxidation.** F. Flusin. *Alluminio*, v. 27, Jan. 1958, p. 13-18.

Review of developments in France in anodic treatment in bulk of small objects. Impregnation of porous castings with bakelite resin prior to anodic treatment reduces number of rejects. Bloom appearing on anodized surface of architectural Al exposed to industrial atmospheres. (L19; Al)

315-L. (German.) **Sand Blast Cleaning of Castings.** H. Koeller. *Giesserei-Praxis*, v. 75, Nov. 25, 1957, p. 489-495.

Proper selection of type and size of blast cleaning equipment depends on the work to be cleaned. Use of metal abrasives versus natural sand advised in most cases. Various models shown. (L10c; 5-60)

316-L. (German.) **Plating and Automation in Volkswagen Plant.** R. O. Becker. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Feb. 1958, p. 45-52.

To be continued. (L17, T21, 18-74)

317-L.* (German.) **Experimentation With Chemical and Electrochemical Removal of Chromium Plating From Copper.** W. Schlittgen. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Feb. 1958, p. 53-57.

Worn Cr plating from Cu printing plates was removed chemically in dilute hydrochloric acid at 50-60° C. Removal time decreases with increasing solution temperature. Test for electrolytic removing was performed in sodium hydroxide solution (8%) with and without bagging. Best results were obtained at a current density of 10-15 amp. per sq. dm. Solution attack on Cu base increases with increasing current density. (L12g, L13n; *Cu, Cr*, 8-62)

318-L.* (German.) **Electropolishing.** Siegfried Gruttner. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Feb. 1958, p. 58-62.

Process applicable to Fe, steel, Cu, Ni and Zn. Chromic acid bath used in pretreatment, followed by degreasing and rinsing. Bath compositions and current densities for polishing various metals. (L13p; CI, ST, Cu, Ni, Zn)

319-L. (German.) **Synthetic Rubber Products for Protection Against Corrosion.** St. Reiner. *Werkstoffe und Korrosion*, v. 9, Jan. 1958, p. 1-4.

7 ref. (L26r)

320-L.* Slide Takes the Curse Out of Tumbling. *American Machinist*, v. 102, no. 4, Feb. 24, 1958, p. 97-99.

Improved barrel confines parts to sliding and rolling actions that remove stock accurately, without damage. Various sizes of barrels are mounted at various angles on rotating face plate. Importance of proper angle and size of barrel, choice of abrasive compound and chips, experience of operator in controlling variables which gives desired finish. (L10d, 1-52)

321-L.* Aluminum Coated Steel. W. E. McFee. *Iron Age*, v. 181, no. 6, Feb. 6, 1958, p. 95-97.

Sheet steel coated on both sides with Al possesses surface characteristics of Al and physical and me-

chanical properties of steel. Materials resist atmospheric corrosion to serve a wide variety of outdoor products. Standard fabrication procedures for cold rolled steel must be modified.
(L22, R3; ST, *Al*, 17-57)

322-L.* High-Frequency Vibrations Slash Barrel Finishing Time. *Iron Age*, v. 181, Feb. 20, 1958, p. 86-87.

New machine with standard barrel vibrates and rotates to give superior finish with ease and speed. This machine cuts finishing time to less than one-half the usual time, more than doubles the normal workpiece loads and successfully tumbles the "impossible" pieces. (L10d, 1-52)

323-L.* How to Grind and Polish Stainless Steel. *Metalworking*, v. 14, no. 3, Mar. 1958, p. 18-21.

Important advantages of stainless steel are lost if the finish is wrong. Equipment and procedures used to get any one of several different surface finishes. Special polishing techniques are used with stainless steel because finishes wanted by users often differ widely. (L10b, G18; SS)

324-L. Vacuum Metallizing With Aluminum. *Light Metal Age*, v. 16, Feb. 1958, p. 32, 34.
(L23, 1-73; *Al*)

325-L. Deburring With Ultrasound. *Steel*, v. 142, Apr. 7, 1958, p. 102-103.
(L10f)

326-L. (French.) **Recent Improvements in Phosphating Techniques.** Roger Lagarde. *Corrosion et Anticorrosion*, v. 6, Mar. 1958, p. 107-108.
(L14b)

327-L. (Book.) **44th Annual Technical Proceedings, American Electroplaters' Society, 1957.** American Electroplaters' Society, 445 Broad St., Newark 2, N. J.

Papers abstracted separately.
(L17)

Metallography

Constitution and Primary Structures

165-M. Technique for Obtaining Thin Foils of Aluminum and Aluminum Alloys for Transmission Electron Metallography. R. B. Nicholson, G. Thomas and J. Nutting. *British Journal of Applied Physics*, v. 9, Jan. 1958, p. 25-27.

Structural changes produced by aging Al-Cu and Al-Zn-Cu alloys investigated by examining foils in the electron microscope. 6 ref.
(M21e, N7a, 4-56; Al, *Cu, Zn*)

166-M.* Intragranular Substructures in High-Purity Nickel. Paul Feltham. *Institute of Metals, Journal*, v. 86, Jan. 1958, p. 237-240.

Technique for developing dislocation etch pits in Ni. In specimens annealed at 850-900° C., the formation of a cell structure with mesh size of the order of 20μ is observed; the density of etch pits delineating it is approximately 3×10^5 per sq. cm. A regular block structure of edge dislocations with a characteristic inter-dislocation spacing of 2-3μ and a corresponding dislocation density of about 10^7 per sq. cm. exists side by side with the cell structure. 14 ref. (M26b; Ni-a)

167-M. A Note on the Zinc-Rich Alloys of the System Zinc-Iron-Nickel. G. V. Raynor and J. D. Noden. *Institute of Metals, Journal*, v. 86, Feb. 1958, p. 269-271.

Investigation by metallographic and X-ray methods. Extraction of crystals by slow anodic solution and examination confirmed the formation of ternary crystals, the composition of which is analogous to the binary compound Zn-Co.
(M24; Zn, *Fe, Ni*)

168-M. Modern Metallography. H. P. Roth. *Metal Progress*, v. 73, Mar. 1958, p. 70-72.

One of the meetings arranged for the Second World Metallurgical Congress in Chicago last November was organized by the U. S. Atomic Energy Commission's Internal Group on Metallography, and considered many advanced metallographic techniques using ultraviolet and visible light, X-rays, emitted rays and electron beams. (M20, M21, M23)

169-M.* The Metallographic View. Pt. 43. Effect of Hardening Temperature on the Micro-Structure of H13 Hot Work Die Steel. R. F. Harvey. *Steel Processing and Conversion*, v. 44, Feb. 1958, p. 82-83.

Coarsening of microstructure above 1900° F. (M27d, 2-64; TS-k)

170-M. Effect of Fast Neutron Irradiation on the Recombination of Electrons and Holes in Germanium Crystals. V. S. Vavilov, A. V. Spitsyn, L. S. Smirnov and M. V. Chukichev. *Soviet Physics-JEPT*, v. 5, Nov. 1957, p. 579-582. (Translation by American Institute of Physics.)

Irradiation of Ge crystals with fast neutrons leads to an increase of the rate of volume combination. The probability of recombination trapping of charge carriers by defects which appear as result of irradiation is estimated. 15 ref.
(M25m, P15, 2-67; Ge)

171-M. (French.) **Contribution to the Study of the Iron-Carbon Equilibrium Diagram. Solubility of Carbon in Pure Iron.** Paul Gendrel and Leon Jacque. *Comptes Rendus*, v. 246, Jan. 27, 1958, p. 596-599.

Solubility of carbon was found to decrease when degree of initial purity of the metal was increased.
(M24b; Fe, C)

172-M.* (French.) **Electron Microscope Study of a Skeleton Structure Formed by Tungsten Carbide Grains in Hard Alloys.** R. Bernard and S. Bernard. *Proceedings of the Third International Conference on Electron Microscopy, London, 1954*, Royal Microscopical Society, 1956, p. 211-212.

Study showed that, contrary to views of Garland and Norton (M.I.T.), a skeleton structure of tungsten carbide grains is formed in hard alloys composed of tungsten carbide and cobalt. Cobalt was eliminated by boiling alloy in hydrochloric acid. (M27d; W, Co, 6-69)

173-M.* (French.) **Examination of Thin Metal Specimens by Electron Microscopy and Diffraction.** R. Castaing. *Proceedings of the Third International Conference on Electron Microscopy, London, 1954*, Royal Microscopical Society, London, 1956, p. 379-383.

By means of electrolytic polishing followed by bombardment with ions, metallurgical specimens may be thinned down sufficiently for observation by transmission electron microscopy or diffraction. Advantages of this method; possibility of thinning during course of observation.
(M21e, M22h)

174-M.* (German.) **Examination of Aluminum-Copper Alloys by Means of Etch Coloring Method.** F. Erdmann-Jesnitzer and W. Bernhardt. *Metall*, v. 11, Dec. 1957, p. 1032-1037.

Purpose of the etch coloring method in investigation of distribution regularity in solid solutions. Experimental technique; results. 18 ref. (M20q; Al, Cu)

175-M.* (German.) **Examples of Application of New Techniques in Metallography.** L. Koch, G. Hein and S. Keste. *Metall*, v. 11, Dec. 1957, p. 1038-1045.

Preparing specimens; mechanical, anodic and chemical polishing; examination in polarized light; use of color photography in microscopy; phase contrast microscopy and high-temperature microscopy; measurement of roughness by interference tester; testing of microhardness. 19 ref. (M20, M21, S14)

176-M. (German.) **Microstructure and Mechanical Properties of Structural Steels.** R. Mitsche and A. Legat. *Radex Rundschau*, no. 5-6, 1957, p. 784-802.

10 ref.
(M-general; Q-general; ST, SGB-e)

177-M. (German.) **Investigations of Nonmetallic Inclusions in Free-Cutting Rimming Steel.** H. Hoff, G. von der Dunk and H. Lessing. *Radex Rundschau*, no. 5-6, 1957, p. 832-839.

Determination of amount of nonmetallic inclusions in ingots of free-cutting rimming steels by various methods; chemical constitution, distribution of inclusions in ingots. 5 ref. (M28; ST-d, SGA-k, 9-69)

178-M. (German.) **Topologic Identification of Structural Members in Metallic and Fireproof Materials.** F. Grasenick. *Radex Rundschau*, no. 5-6, 1957, p. 843-856.

Evaluation of metallographic methods. 45 ref. (M-general)

179-M. (German.) **Accidental Disturbance Error in X-Ray Fluorescence Spectroscopy.** F. Ebert and A. Wagner. *Zeitschrift für Metallkunde*, v. 48, Dec. 1957, p. 646-649.
(M21f)

180-M.* (German.) **Microradiographic Study of Rolling Process.** F. Erdmann-Jesnitzer and Fritz Gunther. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 9-16.

Microradiographic investigation of orientation in rolling, direction and of destruction of Al-Ni and Al-Fe crystals in Al alloys. 14 ref.
(M23n, M26c; Al)

181-M. (German.) **Observations of Decomposition Phenomenon on Metal Crystallites.** Ernst Brüche and Helmut Poppa. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 17-21.

17 ref. (M26, M21e; Cu)

182-M. (German.) **Examination of Ferromagnetic Substances by Electron Diffraction.** Sh. Yamaguchi. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 52-54.
(M22h, P16)

183-M. (German.) **Magnetic, Electric and Electron-Optical Investigations of Thermal Transformation of Cathodic Dispersed Nickel Layers.** L. Reimer. *Zeitschrift für Physik*, v. 149, no. 4, 1957, p. 425-431.

4 ref.
(M-general, P16, N-general; Ni)

184-M.* (Italian.) **Thermodynamic Research on Metal Systems. Note 14. Definition of the Miscibility Gap and Replotting of the Phase Diagram of the Zn-Cd-Bi System.** Mario Fiorani and Luigi Oleari. *Ricerca Scientifica*, v. 27, Dec. 1957, p. 3614-3628.

From emf. measurements taken along four pseudo-binaries with con-

stant Cd and Bi atomic ratios of 6.3/1, 3/1, 1/1 and 1/3 respectively, partial molar thermodynamic quantities for Zn in Zn-Cd-Bi system were obtained. Quantities were used to define miscibility gap at 450, 500 and 550° C., and a graphic procedure was devised to overcome problems arising from position of gap. Partial molar quantities were recalculated for Bi and Cd, thus permitting reconstruction of complete phase diagram. 25 ref.
(M24c; Zn, Cd, Bi)

185-M.* (Russian.) **Influence of Fiber Orientation on Contact Fatigue Resistance of Hardened Steels.** A. S. Shein. *Metallovedenie i Obrabotka Metallov,* Dec. 1957, p. 61-66.

It is possible to discern three kinds of orientation of fibers by macroscopic examination: longitudinal, transverse and facial. Hardened steel with transversely oriented fibers is less tough than that with fibers having facial orientation, but its contact fatigue life is 3 to 5 times longer. (M28, Q7; ST)

186-M.* (Spanish.) **Thermodynamic Theory of Equilibrium Diagrams. Pt. 8. Equilibria in Condensed Ternary Systems.** Francisco Munoz del Corral. *Instituto del Hierro y del Acero,* v. 10, Oct-Dec. 1957, p. 412-428.

Forms of graphic representation of equilibria in ternary systems; functions of ternary phases; internal stability and zones of immiscibility; two, three and four-phase equilibria. 8 ref. (M24c, P12)

187-M.* **Veining in Ferrite.** A. Hultgren, A. Josefsson, E. Kula and G. Lagerberg. *Iron and Steel Institute, Journal,* v. 188, Mar. 1958, p. 247-261.

Microscopic examination of structures appearing in ferrite on hot deformation. Various types of veins and conditions of their formation and regularity. Disappearance and restoration of veins. (M27, N8j; ST)

188-M. **Metallographic Application of X-Ray Scanning Microanalysis.** D. A. Melford and P. Duncumb. *Metallurgia,* v. 57, Mar. 1958, p. 159-161.

A technique using a fine-focus electron beam for determining the composition of a minute area on the surface of a metal. (M21f, S11n)

189-M.* **The Metallographic View. Pt. 42. Grain Size of High Speed Steel—Effect of Reduction.** R. F. Harvey. *Steel Processing and Conversion,* v. 44, Jan. 1958, p. 33-34.

Effects of heat treatment, composition, undissolved carbide and ingot size reduction on the grain size of M10 Mo high speed steel.
(M27c; TS-m, *Mo*)

190-M.* **Factors Controlling the Grain Size of 5 Per Cent Chromium Hot Work Die Steels. Pt. 1.** R. F. Harvey and C. T. Fletcher. *Steel Processing and Conversion,* v. 44, Mar. 1958, p. 129-136, 165.

Size of austenitic grains in AISI H11, H12, H13 and H14 steels is determined principally by austenitizing temperature and time, and composition of steel. Forging and annealing have less effect.
(M27c, 2-64, 2-60; TS-k)

191-M. **High-Temperature Aqueous Corrosion Product Films on Aluminum.** V. H. Troutner. Hanford Laboratories. *U. S. Atomic Energy Commission,* HW-53389, Nov. 15, 1957, 38 p.

The corrosion product films formed on Al alloys 1245 and X8001 in water at 310° C. were examined by X-ray diffraction and by electron and optical miscroscopy. A technique was developed for replicating the inner surface (the surface adjacent to the base metal) of the corrosion product films for electron microscope examination.
(M21c, M21e, M20r, R4; Al-b)

192-M.* (French.) **Quantitative Study of the Drawing Texture of Copper Wire.** R. Faivre. *Revue de Metallurgie,* v. 55, Jan. 1958, p. 53-60.

Studied by use of a recording microphotometer with a special stage which made it possible to explore a quarter of a Debye-Scherrer ring. Quantities defined and measured were proportion of crystallites conforming to laws of preferred orientation, distribution of crystallites between fiber textures [111] and [001], angular dispersion of actual orientation around ideal orientation corresponding to a perfect fiber. 10 ref. (M26c; Cu, 4-61)

193-M. (German.) **Texture Determination in Metallic Materials by Counting Tube Method. Pt. 1. General Considerations and Problems.** F. Haeszner. *Metall,* v. 12, Feb. 1958, p. 89-95.

Determination of texture by correlation of intensity of reflected X-rays. (M26c)

194-M.* (German.) **Silicoborides of the Transition Metals Vanadium, Columbium, Tantalum, Molybdenum and Tungsten.** H. Nowotny, R. Kieffer and F. Benesovsky. *Planseebericht für Pulvermetallurgie,* v. 5, Dec. 1957, p. 86-93.

Investigation of ternary systems for high-temperature alloys by X-ray, microscopy and thermo-analysis. (M24c, M26q; SGA-h)

195-M.* (German.) **Note on Partial System UC-ThC.** H. Nowotny, R. Kieffer, F. Benesovsky and E. Laube. *Planseeberichte für Pulvermetallurgie,* v. 5, Dec. 1957, p. 102-103.

Technique of preparation of uranium monocarbide and thorium monocarbide. Examination of their behavior by X-rays. Wide miscibility of components—carbides and oxides. (M24d; U, Th)

196-M.* (Italian.) **Structure of Anodic Oxide Coatings on Aluminum.** M. Paganelli. *Alluminio,* v. 27, Jan. 1957, p. 3-12.

Coatings were examined by three techniques involving use of electron microscope. Results confirm theory of Keller, Hunter and Robinson concerning cellular structure of porous anodic oxide coatings. 30 ref.
(M27d; Al, 8-73)

197-M. (Japanese.) **Employment of Recent Advances in the Optical and Electron Microscope.** Hideo Nishimura. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 3-4.

(M21c, M21e)

198-M.* (Czech.) **Contribution to Metallographic Examination of Transformer Steel.** Ivan Hrivnak. *Hutnické Listy,* v. 12, no. 12, 1957, p. 1094-1096.

Electron microscope examination of transformer steel containing 0.03% C, 4.39% Si, 0.10% Mn, 0.1% Cu reveals many cases of twinning and multiplying ferritic grain growth. (M27; ST, SGA-n)

199-M.* (Book.) **Powder Method in X-Ray Crystallography.** Leonid V. Azaroff and Martin J. Buerger. 342 p. 1958. McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. $8.75.

Techniques for determining crystal structure and identifying materials using powder X-ray diffraction. Equipment, theory and mathematical analysis of diffraction patterns. (M22g)

N Transformations and Resulting Structures

154-N.* **Age-Hardening Mechanism in Magnesium-Lithium-Zinc Alloys.** J. B. Clark and L. Sturkey. *Institute of Metals, Journal,* v. 86, Feb. 1958, p. 272-276.

Precipitation of Li-Zn phase studied by hardness measurements and metallographic and X-ray diffraction methods during aging; behavior of alloy at various temperatures; formation of transition structure and its composition; cause of instability in strength of alloy.
(N7a; Mg, *Li, Zn*)

155-N. **Mechanism of Formation of Polygonization Sub-Structures Observed on Alpha-Uranium After Heat Treatment in the Gamma-Phase.** A. Robillard and D. Calais. *United Kingdom Atomic Energy Authority,* IGRL-T/C-53, Nov. 1957, p. 3-4. (From *Comptes Rendus,* v. 245, 1957, p. 309-312.)

(N9; U)

156-N. (French.) **Discontinuous Recrystallization of Aluminum-Copper Alloys.** Christiane Renon and Jean Calvet. *Comptes Rendus,* v. 246, Jan. 13, 1958, p. 269-272.

(N5f; Al, *Cu*)

157-N.* (French.) **Study of the Aging of Pure Iron by Measurement of Its Electrical Resistance at Very Low Temperatures.** Bernard Migaud and Michel Wintenberger. *Comptes Rendus,* v. 246, Jan. 20, 1958, p. 425-428.

Study revealed nature of precipitation of atoms of dissolved carbon and showed that annealing at temperatures below 200° C. causes these precipitates to evolve and rapidly lose their influence on mechanical properties and electrical resistance.
(N7, 2-63, P15g; Fe-a)

158-N. (French.) **Intergranular Accumulation of Sulphur in Pure Iron Charged in Cathodic Hydrogen in the Presence of Sodium Sulphide.** Simone Besnard and Jean Talbot. *Comptes Rendus,* v. 246, Jan. 27, 1958, p. 607-608.

(N1h; Fe-a, *S*)

159-N.* (French.) **Contribution to the Study of TTT Curves in Steels.** L. Harbraken. *Proceedings of the Third International Conference on Electron Microscopy, London, 1954,* Royal Microscopical Society, 1956, p. 202-206.

Electron metallography revealed various structures in low-alloy steels not revealed by optical metallography. Use of related methods (X-ray study, electron diffraction), as well as study of precipitates extracted by electrolysis, made possible confirmation of existence of these structures and definition of their nature. Suggested interpretations are advanced.
(N8, M21e; AY)

160-N.* (French.) **Movies of the Recrystallization of Metals Observed by Emission Microscope.** M. Gauzit. *Proceedings of the Third International Conference on Electron Microscopy, London, 1954,* Royal Microscopical Society, 1956, p. 210.

Commentary on presentation of film showing recrystallization phenomena in molybdenum. (N5, M21e)

161-N.* (French.) **Application of Electron Microscopy to Study of Solid State**

Transformations in Some Metals and Alloys. A. Saulnier. *Proceedings of the Third International Conference on Electron Microscopy, London, 1954,* Royal Microscopical Society, 1956, p. 213-217.

Structural transformations produced by hardening and tempering in Al-Cu, Al-Mn and Cu-Be alloys, and in Ti and its alloys. Electron micrographs, obtained by oxide and celluloid-silica replica methods. (N-general, M21e; Al, Ti)

162-N. (German.) **Diffusion of Oxygen in Tantalum.** E. Gebhardt, H. D. Segezzi and A. Stegherr. *Zeitschrift für Metallkunde,* v. 48, Dec. 1957, p. 624-627.

(N1c; Ta, *O*)

163-N.* (Russian.) **Processes of Recrystallization of Nickel Alloys.** M. E. Blanter and L. I. Kuznetsov. *Metallovedenie i Obrabotka Metallov,* Dec. 1957, p. 31-36.

Investigation of Ni alloys for gas turbines. Bimetallic alloys of varying composition were prepared, heat treated at 885° C., and compressed at room temperature. Grain size was determined by method of accidental secants. In Ni-Mo alloys, beginning of softening was marked by a reverse trend in temperature of recrystallization which abruptly rises when Mo reaches 8%. There is a relationship between softening and cold working. Various content of Co, Cr, Ti or Mo changes the character of softening. (N5, 2-60; Ni)

164-N.* (Russian.) **Distribution of Chromium Between Phases of White Cast Iron.** I. E. Lev. *Metallovedenie i Obrabotka Metallov,* Dec. 1957, p. 49-52.

Analysis of ferrite and cementite in white cast iron shows that Cr is largely concentrated in the carbide form. Distribution of Cr is not permanent but depends on such factors as high temperature and thickness of the poured metal. Cr content in the carbide phase is influenced by the rapidity of cooling. The greater the carbide phase the greater the quantity of ferrite with Cr. Isothermal heating results in greater Cr concentration in the carbide phase. 10 ref. (N8r; CI-p, *Cr*)

165-N.* **Isothermal Transformation of Spheroidized Pearlite to Austenite.** A. A. Golestaneh, C. Handford and G. Bullock. *Iron and Steel Institute, Journal,* v. 188, Mar. 1958, p. 237-241.

Investigation on isothermal transformation of plain carbon steel by electrical resistance technique. Influence of cementite distribution and transformation temperature. Spheroidized pearlite begins transforming earlier than lamellar pearlite. Above 740° C. transformation of lamellar pearlite is completed more quickly. Transformation-time diagrams given. (N8g; ST)

166-N.* **Study of the Ferritization of Nodular Iron.** Earl J. Eckel. *Modern Castings,* v. 33, Apr. 1958, p. 85-99.

Nodular irons of two compositions were subjected to four types of ferritizing heat treatment; slow cooling through eutectoid range; quenching to and holding at temperatures both below and above the critical temperature for isothermal transformation; reheating of pearlitic structures to various temperatures and tempering of martensitic structures. Results of this response, tensile and impact properties of the treated specimens, quantitative metallography. 11 ref. (N8; CI-r)

167-N.* (English.) **Contribution to the Estimation of M$_s$ from the Composition of Steels.** J. A. Verö. *Acta Technica Academiae Scientiarum Hungariae,* v. 19, Aug. 1957, p. 193-197.

Since starting temperatures of martensite formation vary in a nonlinear fashion, depending on carbon content, previously proposed linear equations give inaccurate results. A parabolic equation is presented which corresponds closely with experimental data. (N8p, ST)

168-N.* (Czech.) **Graphitization of Pearlitic Cementite in Spheroidal Graphite Cast Iron at Hypoeutectoid Temperatures.** Stanislav Drapal. *Hutnické Listy,* v. 13, Jan. 1958, p. 42-49.

Decomposition of the cementite reveals that spheriodization and coagulation occur first. Graphitization is not pronounced until after a time which increases with increasing Cr content, decreasing temperature and diminishing Si content. During graphitization, Cr in the residual complex cementite increases. The cementite undecomposed increases with increasing Si content. Cr in the cementite is higher in cast iron containing more Si. 20 ref. (N8s; CI-r)

169-N. (Czech.) **Carbide Grain Growth in the Production of Carbide-Containing Hard Alloys by Means of Powder Metallurgy. Pt. 1.** Bohuslav Cech. *Hutnické Listy,* v. 13, Feb. 1958, p. 113-118.

Dependence of grain growth on temperature and sintering time. 17 ref. (N3m, H-general; 6-69)

170-N. (Czech.) **Carbide Grain Growth in the Production of Carbide-Containing Hard Alloys by Means of Powder Metallurgy. Pt. 2.** Bohuslav Cech. *Hutnické Listy,* v. 13, Feb. 1958, p. 118-122.

Influence of alloying carbides on grain growth process. 13 ref. (N3m, 2-60, H-general; 6-69)

171-N. (Czech.) **Bainite Reaction.** Josef Cadek and Dagmar Tlusta. *Hutnické Listy,* v. 13, Feb. 1958, p. 123-133.

Kinetics and characteristics of the reaction. 44 ref. (N8m)

172-N.* (French.) **Some Decomposition Structures in Austenitic Manganese Steels.** Rene Castro and Pierre Garnier. *Revue de Metallurgie,* v. 55, Jan. 1958, p. 17-23.

Study of transformation structures in 12-15% Mn Hadfield steel during isothermal heat treatment to establish a relation between thermal history of parts out of service and their micrographic structure a posteriori. Particular attention paid to structures of the upper area of the transformation range. 7 ref. (N8g; AY, *Mn*)

173-N.* (French.) **Method of Determining the Coefficient of Diffusion of Hydrogen in Steel. Influence of Micrographic Structure on This Diffusion.** Paul Bastien and Pierre Amiot. *Revue de Metallurgie,* v. 55, Jan. 1958, p. 24-38.

Review of classic theories of diffusion and presentation of new theoretical method for more accurate determination of diffusion coefficients. Method applied to carbon and low-alloy ferritic steels. Results showed that structures which are most stable thermodynamically, with finely divided carbides (globular pearlite), have higher diffusion coefficients than those of other structures possible in ferritic steels. 36 ref. (N1a; ST, *H*)

174-N.* (French.) **Structural Changes in a 10% Nickel Stainless Steel Deformed at Temperatures Between −200° and 800° C.** Bernard Jaoul. *Revue du Nickel,* v. 23, Oct-Dec. 1957, p. 91-97.

Formation of martensite by decomposition of austenite during deformation at lower-than-ambient temperatures depends on stress applied. Bainitic transformation, in which diffusion is also involved, is product of speed and temperature at which deformation occurs. In steel studied, bainitic structure appears as a result of slow deformation under tensile stresses of over 45 kg. per sq. mm., at temperatures between ambient and 600° C. 6 ref. (N8m, 3-68, SS, *Ni*)

175-N.* (Hungarian.) **Diffusion of Carbon in Gamma Iron Containing Titanium.** Janos Prohaszka. *Kohaszati Lapok,* v. 12, July 1957, p. 269-275.

Increase of Ti content slows down carbon diffusion. Diffusion factor changes because the separation of Ti causes change in atomic structure. 21 ref. (N1, 2-60; Fe, *Ti*)

176-N.* (Japanese.) **Solidification of Magnesium Treated Cast Iron.** Goro Ohira and Katsuya Ikawa. *Casting Institute of Japan, Journal,* v. 29, Nov. 1957, p. 772-781.

Nodular graphite may be formed by separation as primary graphite in hypereutectic at pro-eutectic temperature; separation on dendrites of primary austenite in hypereutectic below eutectic temperature; separation from spheroidal austenite in slightly hypo-eutectic and separation from super-cooled primary austenite dendrite in hypo-eutectic with low degree of carbon saturation at end of solidification process. 11 ref. (N12, E25q; CI-r)

177-N. **Change in Structure of Cemented Carbides on Heating.** P. K. Mikhailova. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 45-48. (Henry Brutcher, Altadena, Calif., Translation no. 4045.)

Previously abstracted from original. See item 71-N, 1957. (N3, 2-62, 6-69; W, Co)

178-N. (English.) **Study of the Eutectoid Transformation of Cu-Al Alloys by Measuring Young's Moduli.** Toshimasa Morooka. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 55-56.

(N9; Cu, Al)

179-N.* (English.) **Study on Bimetal Casting, Especially on the Adhesion Phenomenon Between Copper and Brass.** Tsunemitsu Muraki. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 73-75.

Adhesion phenomenon investigated by contacting small pieces of brass having various Zn concentrations with pure Cu at high temperatures in an atmosphere of inert gas. Adhesion appears to be controlled by intermetallic diffusion of constitutional elements of both metals. (N1h, L22; Cu-a, Cu-n)

180-N.* (Czech.) **Influence of Silicon and Chromium on Eutectoid Transformation of Austenite During Continuous Cooling of Spheroidal Cast Iron.** Stanislav Drapal. *Hutnické Listy,* v. 12, no. 12, 1957, p. 1087-1094.

Relationship between Si and Cr content and cooling velocity on the transformation of austenite. Increasing the cooling rate suppresses formation of ferrite; Si shortens incubation period and supports formation of ferrite; Cr prolongs incubation period and suppresses formation of ferrite.
(N8, 2-60; CI-r, *Si, Cr*)

181-N.* (Polish.) **Influence of Hot Plastic Working Upon Isothermal Transformation of Austenite in Chromium-Nickel-Molybdenum Structural Steel.** Tadevsz Maliewicz. *Hutnik*, v. 24, Nov. 1957, p. 427-436.

TTT-curves for steel containing 0.36% C, 1.43% Cr, 1.46% Ni and 0.23% Mo at 850, 950 and 1050° C. Raising the temperature of transformation decreases transformation rate in pearlitic region. Influence of plastic deformation explained as function of three factors: formation of coarse grain, compression and slow austenitic transformation. 14 ref. (N8g, 3-68; AY, *Cr, Ni, Mo*)

182-N.* (Polish.) **Steel Transformation on Rapid Heating.** Stanislaw Gorczyca and Tadeusz Boniszewski. *Hutnik*, v. 24, Nov. 1957, p. 436-448.

Texture of austenitic grains formed on slow and rapid heating. Recrystallization of austenite. Investigation of the crystalline structures of overhead steel obtained upon rapid heating. Attempt to explain austenite recrystallization as a result of the end of dissolution of carbides with simultaneous displacement of small-angle borders. 29 ref. (N8; ST)

183-N.* (Polish.) **Crystallography of Martensitic Transformation.** Jan Karp. *Hutnik*, v. 24, Nov. 1957, p. 448-452.

Survey of several scientists' opinions upon crystallographic relationship and mechanism of the martensitic transformation. 12 ref. (N8p; ST)

184-N. (Russian.) **Structural Abnormalities of Gray Iron.** A. A. Zhukov. *Liteinoe Proizvodstvo*, Dec. 1957, p. 16-20.

Theoretical basis for reverse liquation of Si in Fe, and proof that counter formation of cementite is one of its manifestations. (4 ref. (N8; CI, *Si*)

185-N. (Russian.) **New Method of Investigating Iron.** I. G. Girshovich and L. S. Drugach. *Liteinoe Proizvodstvo*, Dec. 1957, p. 22-23.

Method of determining coefficient of ionic diffusion by studying speed of anodic oxidation has attracted wide interest, although results are not yet conclusive. (N1c, L19; Fe)

QUARTERLY REVIEWS OF REACTOR PROGRESS

The U. S. Atomic Energy Commission issues three Technical Progress Reviews. These authoritative quarterlies summarize the important current documents in the respective fields. They are entitled:

Power Reactor Technology
Reactor Core Materials
Reactor Fuel Processing

Subscription to each is $2 annually.

Order from: Superintendent of Documents Washington 25, D. C.

Physical Properties

159-P.* **Use of Search-Coil Apparatus for Eddy Current Testing of Copper and Its Alloys.** N. B. Harvey. *Institute of Metals, Journal*, v. 86, Feb. 1958, p. 252-256.

New apparatus for rapid determination of conductivity. Main uses are for direct measurement of electrical conductivity, quantitative determination of small additions of a second element and indirect measurement of tensile properties in age hardened Cu alloys.
(P15g, Q27a, S11, 1-53; Cu)

160-P.* (French.) **Magnetoelectric Properties of Thin Films of Nickel Magnetized to the Saturation Point.** Therese Rappeneau. *Comptes Rendus*, v. 246, Jan. 27, 1958, p. 571-574.

Thin films of Ni obtained by thermal evaporation were studied at room temperature between 4000 and 8000 Oe. Respective variations in electrical resistivity in function of magnetic field and angle between field and current were determined. Results compared with those given for solid Ni. (P16, P15g; Ni, 14-62)

161-P. (French.) **Study of the Magnetic Properties of a Series of Copper-Nickel Alloys.** Andre J. P. Meyer and Claude Wolff. *Comptes Rendus*, v. 246, Jan. 27, 1958, p. 576-579.

6 ref. (P16; Cu, Ni)

162-P.* (French.) **Predictions of Curie Temperature for Different Types of Crystal Lattices.** G. Fournet. *Journal de Physique et le Radium*, v. 18, Dec. 1957, p. 663-671.

Review of Yvon theory; application to flat square-base lattice, flat triangular, hexagonal, face-centered cubic, simple cubic and cubic-centered structures gives very good approximate results. Concludes that theory is equally valid for all structures. 22 ref. (P16d, M26)

163-P.* (French.) **Electronic Theory of Metals and Its Applications to the Electrical Conductivity of Metals and Alloys.** Eugene Darmois. *Societe Francaise des Electriciens, Bulletin*, v. 7, Dec. 1957, p. 754-764.

Exposition of Drude-Lorentz and Summerfeld theories and some newer theories; equations for liquid Hg, Bi, Ga, Cu and K; consideration of Al-Cu alloys and others; description of a study of Al bronzes.
(P15g; Hg, Bi, Ga, Cu, K, Al, 14-60)

164-P. (German.) **Conductivity and Hall Constant. Pt. 6. Aluminum-Silver Alloys.** W. Koster and W. Schule. *Zeitschrift für Metallkunde*, v. 48, Dec. 1957, p. 628-633.

(P15g, P15p; Al, Ag)

165-P.* (German.) **Development of Alnico Magnets Containing Copper and/or Titanium.** Wilhelm Zumbusch. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 1-8.

Improvement of Al-Ni-Co-Fe alloys by addition of Cu and Ti, also by two-stage tempering and annealing in magnetic field. Development of anisotropic magnets. Testing of magnets. (P16, 2-60; SGA-n)

166-P. (German.) **Theory of Ferromagnetism. Pt. 1. Atomic Structure.** Klaus Meyer. *Zeitschrift für Naturforschung*, v. 12a, Oct. 1957, p. 786-797.

8 ref. (P16, M25)

167-P. (German.) **Electric Conductivity of Metals at Low Temperatures.** I. Supek. *Zeitschrift für Physik*, v. 149, no. 3, 1957, p. 324-328.

(P15g, 2-63)

168-P.* (Spanish.) **Influence of Mechanical Cuts on the Magnetic Properties of a Silicon Steel.** Victor S. Giron Nunez. *Instituto del Hierro y del Acero*, v. 10, Oct-Dec. 1957, p. 429-440.

Five specimens of silicon steel in different conditions of stress were studied and variations of as much as 100% were found in their magnetic properties. By attributing to the internal stresses a parameter related to the reversible magnetizing force, a linear variation in terms of this parameter is found for the coercive field and hysteresis losses. The magnetic field for which the maximum of permeability is produced is also related to this parameter by means of a linear function.
(P16, 3-66; AY, *Si*)

169-P.* **Solubility of Nitrogen in Iron-Chromium Alloys.** E. T. Turkdogan and S. Ignatowicz. *Iron and Steel Institute, Journal*, v. 188, Mar. 1958, p. 242-247.

Determination of solubility of nitrogen in Fe-Cr alloys at 900-1400° C. Results of examination by X-ray. Activity of nitrogen in alpha and liquid phases; effect of nitrogen on austenite stability. (P12e; Fe, Cr, *N*)

170-P. **Microwave Resonance in Nickel at 35 Ge/s (kMc/s).** G. S. Barlow and K. J. Standley. *Physical Society, Proceedings*, v. 71, Jan. 1, 1958, p. 45-48.

13 ref. (P17c; Ni, Cu)

171-P. **Physical Properties of Certain Liquid Binary Alloys of Tin and Zinc.** T. C. Toye and E. R. Jones. *Physical Society, Proceedings*, v. 71, Jan. 1958, p. 88-99.

Viscosity, density and specific resistance of several Sn-based and Zn-based binary alloys over various temperature ranges.
(P10a, P10f, P15g; Sn, Zn)

172-P.* **Convection and Radiation in High Speed Heating.** Norman H. Davies and Richard J. Reed. *Steel Processing and Conversion*, v. 44, Mar. 1958, p. 155-160, 162.

High-speed heating produces less scale on pieces, permits smaller furnaces and is adaptable to automation; however, overheating and nonuniformity problems arise, initial cost is high. Convection and radiation methods are both applicable.
(P11, J-general)

173-P. **Electronic Specific Heat of Sodium Tungsten Bronze.** Robert W. Vest, M. Griffal and J. F. Smith. Iowa State College. *U. S. Atomic Energy Commission*, ISC-899, Mar. 1957, 75 p.

50 ref. (P12r; Cu-s, *Na, W*)

174-P.* (English.) **Effect of Silicon, Chromium and Manganese on Equilibrium of Carbon and Oxygen in Molten Iron Saturated With Carbon. Pt. 2.** Siro Ban-ya and Sachio Matoba. *Tohoku University, Technology Reports*, v. 22, no. 1, 1957, p. 97-108.

Addition of Si (5.2%) causes a decrease in solubility of graphite, while Cr (20%) and Mn (40%) increase solubility. Formation of oxides was not observed in the gas phase. Effects of these additions on the activity of graphite were computed. Addition of Si decreases oxygen content, while Cr increases it. Interaction parameter of carbon and

oxygen in molten Fe was calculated in the 3.4-7% range. 15 ref. (P12, 2-60; Fe)

175-P. (German.) **Stability of Molybdenum Sulphide in Gases at High Temperatures.** G. Eckert. *Werkstoffe und Korrosion,* v. 9, Feb. 1958, p. 69-72.

12 ref. (P13, 2-62, 2-66; Mo, 14-68)

176-P.* (Japanese.) **Study of Aluminum Conductors. Pt. 2.** Kengo Ikeda, Tosio Isobe and Akira Hanada. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 5-18.

Effects on electrical conductivity and tensile strength of addition of various metals. Si, Fe, Cu, Cr, Mn, Mg, Ti and V lower conductivity; B tends to decrease conductivity of Ti and V. Th, V, B, and Zn lower tensile strength, while Si, Fe, Cu, Mg, Zr, Ca, and Ni increase it. The small amount used in this experiment indicates that Ni, Ca and Zr increase tensile strength without effecting conductivity. 15 ref. (P15g, 2-60, Q27a; Al, SGA-r)

177-P. Nickel Alloys for Controlled Thermal Expansion. E. M. Wise. *Inco,* v. 27, Dec. 1957, p. 19-21.

Information on the thermal expansivity of Ni-Fe and other Ni alloys. (P11g; Ni-b)

178-P. Get Tailor-Made Properties With Sintered Steel. Robert Talmage. *Iron Age,* v. 181, Apr. 3, 1958, p. 104-106.

(P10a; 6, ST)

179-P. (French.) **Magnetic Nuclear Resonance.** R. E. Richards. *Metaux-Corrosion-Industries,* v. 32, Dec. 1957, p. 482-489.

20 ref. (P16f)

180-P. (Book.) **Permanent Magnet Handbook.** Earl M. Underhill. 380 p. 1957. Crucible Steel Co. of America, Pittsburgh 30, Pa. $10.

(P16; SGA-n)

Q Mechanical Properties and Tests

323-Q. Back Twist in the Manufacture of Wire Rope. Joseph Regensburger, Jr. *Draht (English Edition),* no. 32, Dec. 1957, p. 11-15.

Change of properties of wire rope caused by variations of twist and back twist. Diagrams and mathematical formulas. (Q1, K13a, T7g)

324-Q.* Softening of Cold Worked Metal by Alternating Strain. W. A. Wood and R. L. Segall. *Institute of Metals, Journal,* v. 86, Jan. 1958, p. 225-228.

Measurements of the proof stresses required to impose successive reversals of plastic strain on specimens of cold worked Cu, Ni and Al subjected to alternating torsion tests. Further strain hardening occurs as the first reversals are applied but this hardening soon reaches a peak which is followed by softening. The latter is the more marked as the preliminary cold working is heavier and the plastic amplitude smaller. 9 ref. (Q23a, Q1; Cu, Ni, Al)

325-Q.* Cracking of Mercury-Coated Alpha-Brass Under Alternating Strain. W. A. Wood. *Institute of Metals, Journal,* v. 86, Jan. 1958, p. 228-231.

The phenomenon of mercury-cracking is utilized to determine how effective different amplitudes may be in building up local internal stresses, and so to test theories which attribute fatigue failure to local development of high stresses. The effectiveness of the alternating strain decreases sharply below a particular range of amplitudes, and as a result of this and related effects it is suggested that two mechanisms of fracture exist, one for large amplitudes and one for small. (Q7, Q26)

326-Q.* Extrapolation of the Stress-Rupture Properties of the Nimonic Alloys. W. Betteridge. *Institute of Metals, Journal,* v. 86, Jan. 1958, p. 232-237.

Four methods proposed for the extrapolation of the stress-rupture properties of high-temperature alloys are compared with regard to their application to the Ni-base alloys Nimonic 80A and Nimonic 90. The best results were obtained by using a time-temperature parameter. 7 ref. (Q3q; Ni, SGA-h)

327-Q.* Wear of Metals. F. T. Barwell. *Institute of Metals, Journal,* v. 86, Feb. 1958, p. 257-269.

Mechanism of wear. Wear conditions, such as rolling contact, scuffing, fretting corrosion and the effect of oxygen on friction and surface damage during simple sliding. (Q9n)

328-Q.* Interaction Between Slip Bands and Particles of Precipitate in an Aluminium Alloy. Shigeyasu Kodo and Taro Takeyama. *Institute of Metals, Journal,* v. 86, Feb. 1958, p. 277-280.

Alloy was aged at 250° C. to a point just beyond the hardness maximum. After heat treatment the alloy was stretched by 1-2%. Slip bands were short and of the lamellar type, and platelets in their path were bent. Similar bending was observed on specimens taken from the interior of the alloy, suggesting that slip phenomena in the interior are similar to those on the surface. (Q24c, N7a; Al)

329-Q.* Further Observations on the Ductility of Chromium. H. L. Wain, F. Henderson, S. T. M. Johnstone and N. Louat. *Institute of Metals, Journal,* v. 86, Feb. 1958, p. 281-288.

Nitrogen, present as an impurity, can raise the ductile-brittle transition of cold rolled Cr by at least 300° C., but oxygen in the range 0.01-0.06% produces no marked or consistent effect. Evidence for Cottrell locking in Cr is advanced, particularly in respect of the temperature-dependence of yield stress and brittle fracture stress. (Q23p, Q23r, 3-69; Cr)

330-Q.* Relationship Between Scleroscope, Rockwell, and Brinell Hardness Readings. N. R. Arant and J. J. Marsalka. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 160-161.

Controlled series of hardness tests were conducted on chill iron, grain iron and carbon steel, resulting in a table for converting from C-2 Scleroscope to Rockwell hardness values and vice versa. (Q29e)

331-Q. Russian Research on Lubrication and Wear. Douglas Godfrey. *Lubrication Engineering,* v. 14, Jan. 1958, p. 27-31.

Kinetics of lubricant additive; action and use of radioactive isotopes of sulphur and phosphorus to measure amount of film formed. 11 ref. (Q9, 1-59, 18-73, NM-h)

332-Q.* Surface Fatigue of Carbonitrided Steel. G. W. Powell, M. B. Bever and C. F. Floe. *Metal Progress,* v. 73, Mar. 1958, p. 67-69.

The pitting of worn carbo-nitrided surfaces is shown to be related to case depth and amount of retained austenite. Performance of carburized surfaces, run in conjunction, indicates case depth to be the prime factor. (Q7, Q9, J28m; ST)

333-Q.* Improvement in High-Temperature Alloys by Boron and Zirconium. W. J. Pennington. *Metal Progress,* v. 73, Mar. 1958, p. 82-86.

While most tramp elements have been regarded as detrimental to high-temperature alloys, it is found that additions of 0.01% B and 0.10% Zr (or both), usefully reduce the tendency to notch brittleness at service temperatures and improve rupture strength. (Q3m, Q26s, 2-60; SGA-h, Fe, Ni, Co, *Zr, B*)

334-Q. What's Happened to Cermets. J. W. Graham and W. F. Zimmerman. *Metal Progress,* v. 73, Mar. 1958, p. 89-91.

Originally intended for jet engine parts, cermets have become useful in other fields. Their resistance to corrosive liquid metals and acids makes them valuable for pump seals in rockets and nuclear plants. (Q-general, T2p, T11, 17-57; 6-70)

335-Q. Effect of Temperature on Rolling-Contact Fatigue Life With Liquid and Dry Powder Lubricants. Thomas L. Carter. *National Advisory Committee for Aeronautics, Technical Note 4163,* Jan. 1958, 40 p.

Life of AISI M-1 toolsteel decreases with increasing temperature. 10 ref. (Q7b, 2-61; TS, NM-h)

336-Q. Ultrasonic Absorption in Metals. A. I. Akhiezer, M. I. Kaganov and G. Ia. Liubarskii. *Soviet Physics-JEPT,* v. 5, Nov. 1957, p. 685-688. (Translation by American Institute of Physics.)

4 ref. (Q21f)

337-Q.* The Minimum Bend Radii of Aluminum Alloy Tubes. D. A. Barlow. *Welding and Metal Fabrication,* v. 26, Mar. 1958, p. 90-95, 110.

Tests on tubing of various hardnesses and ratios of outside diameter to wall thickness. (Q5g; Al, 4-60)

338-Q. (French.) **New Anti-Wear Coating.** Felix Barbas. *Machine Moderne,* v. 52, Jan. 1958, p. 21-25.

Tests of Pb-Mo sulphide coatings. (Q9p; Mo, Pb; NM-h)

339-Q. (French.) **Possibilities of Modern Castings.** Jean Gonin and Gerard de Smet. *Machine Moderne,* v. 52, Jan. 1958, p. 57-65.

State of development of special castings; Ni-Resist, Ni-Hard, austenitic Ni-Cr-Mo, pearlitic, phosphoritic and others. (Concluded.) (Q-general, E-general; Ni, SS, SGA-h, 5)

340-Q. (French.) **Kinematic Aspects of Fracture.** J. Leeuwerik. *Métaux Corrosion Industries,* v. 32, Nov. 1957, p. 443-457.

Study of fracture causes and propagation by means of geometric fracture figures; new ultrasonic methods; treatment of different materials; increasing fracture resistance. 20 ref. (Q26)

341-Q.* (German.) **Tensile Strength of Aluminum Sand Castings Cast From Remelted Alloys.** Hans Reininger. *Giesserei-Praxis,* no. 4, Feb. 25, 1958, p. 57-69.

Composition of seven alloys and technique of test casting. Measurements on untreated and treated (chlorinated) specimens. Relationship between tensile strength, break-

ing tension and chlorine treatment. (Q27a, 2-60; Al, 5-60)

342-Q.* (German.) **Classification of Steel Structures From the Point of View of Their Resistance to Brittle Fracture.** K. Rühl. *Schweissen und Schneiden*, v. 10, Feb. 1958, p. 39-44.

New German standard (DIN 17.000) and advice of German Committee for Steel Construction for classification of steel quality; transition temperature as a criterion for safety against brittle fracture; deformation values (stretching, necking, bending angle) cannot be used as criteria because it is impossible to reduce the variables to one simple value. (Q26s, Q23r; ST, SGA-s)

343-Q. (German.) **Problem of Brittle Fracture of Steel.** W. Felix and T. Geiger. *Schweisstechnik*, v. 11, Dec. 1957, p. 158-162.

Examination of deformation state of crystals by X-ray (back-reflection method). Correlation between crystal orientation, microhardness and deformation behavior. (Q26s; ST)

344-Q. (German.) **Properties of Metal Melts. Pt. 14. Internal Friction of Lead-Tin and Lead-Antimony Alloys.** E. Gebhardt and K. Kostlin. *Zeitschrift für Metallkunde*, v. 48, Dec. 1957, p. 636-641.

(Q22, P10f; Pb, *Sn*, *Sb*)

345-Q.* (German.) **Transient Creep in Face-Centered Cubic Metal Crystals.** Hubert Blanck. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 27-39.

Experimental technique with a new interference optical apparatus. Evaluation of results. Creep behavior at various temperatures. Quantitative correlation to stress-strain curve. 22 ref. (Q3; Al, Cu, Ni)

346-Q. (German.) **Deformation Anisotropy of Ordered Solid Solutions.** Hans-Joachim Bunge. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 40-42.

8 ref. (Q24g; 14-67)

347-Q.* (German.) **Resistance to Upsetting by Zinc and Zinc Alloys.** Erich Pelzel. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 47-52.

Resistance to upsetting in relation to orientation of crystallites. Influence of soluble and insoluble additions. 12 ref. (Q24, F22j; Zn)

348-Q.* (Italian.) **Properties of Bronze Test Bars.** Ernesto Bosio. *Fonderia Italiana*, v. 7, Jan. 1958, p. 9-12.

Tests to determine influence of feeding system, pouring temperature and degassing of molten metal on ultimate strength and per cent elongation. (Q27a, E23; Cu-s)

349-Q.* (Italian.) **Some Aspects of the Hot Working of Magnesium and Magnesium-Base Alloys.** G. Tosatto. *Metallurgia Italiana*, v. 49, Dec. 1957, p. 817-824.

Experimental hot rolling, extrusion and forging and subsequent testing revealed influence of prior annealing, working temperature and speed, percentage of reduction and other factors on mechanical characteristics of products obtained. 4 ref. (Q-general, F22, F23, F24, 1-66; Mg)

350-Q.* (Portuguese.) **Brittle Fracture in Automotive Suspension Springs.** Alberto A. Arantes, Michael L. Pinkuss and Francisco P. do Canto. *ABM, Boletim da Associacao Brasileira de Metais*, v. 13, Oct. 1957, p. 319-327.

Study of springs made of Brazilian steels and steels from other countries leads to conclusion that principal cause of brittle fracture of springs in vehicles in service in Brazil is condition of roads in that country. Use of more resilient, tougher steels is recommended. 10 ref. (Q26; ST, SGA-b)

351-Q.* (Russian.) **Nature of Critical Degree of Deformation.** Y. R. Rauzin and A. R. Zheleznyakova. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 41-48.

Recrystallization of metals after minor deformation is little studied. Rapid grain growth during heat treatment is associated with initial state of deformation. This state is characterized by intergrain transfer in polycrystalline metals such as Al. Critical interval appears during slow deformation. Active forces wedge and dislodge grains which become distorted. New grains are formed during subsequent heating. 7 ref. (Q24, N5)

352-Q. (Russian.) **Effect of Deep Anodizing on the Fatigue Resistance of Aluminum Alloys AK-4 and VD-17.** A. S. Nikishov, G. V. Kurganov and N. I. Yarzhemskaya. *Metallovednie i Obrabotka Metallov*, Dec. 1957, p. 66-68.

(Q7a, L19; Al)

353-Q.* **Wear Resistance: Is Melting Point the Key?** H. A. Unckel. *Iron Age*, v. 181, Mar. 20, 1958, p. 97-100.

Abrasion tests on Al, Cu and Fe samples by sandblasting, carborundum belts and carborundum powder indicate a correlation between abrasion resistance and melting point. 6 ref. (Q9n, P12n)

354-Q.* **Effect of Phosphorus on Tensile and Notch-Impact Properties of High-Purity Iron and Iron-Carbon Alloys.** B. E. Hopkins and H. E. Tipler. *Iron and Steel Institute, Journal*, v. 188, Mar. 1958, p. 218-237.

Investigation on various Fe-P and Fe-P-C alloys. Presence of phosphorus increases strength of alloys and produces progressive development of grain-boundary weakness. In the Fe-P-C alloys carbon eliminates grain-boundary weakness in case of slow cooling after heat treatment. (Q27a, Q6n, 2-60; Fe, *P*)

355-Q.* **A New Standard Hardness Testing Machine.** R. S. Marriner and F. C. P. Mason. *Metallurgia*, v. 57, Jan. 1958, p. 47-51.

A new diamond pyramid hardness testing machine using freely suspended dead weights and a micrometer microscope. (Q29c, 1-53)

356-Q.* **Strain Hardening Behavior of High Purity Copper. An Appraisal of Tests by Carreker and Hibbard.** E. Voce. *Metallurgia*, v. 57, Mar. 1958, p. 111-116.

Effects of temperature from −253 to 950° C. and grain size on various tensile properties of high-purity copper. (Q27a, 2-61, 2-59; Cu-a)

357-Q. **Materials for Aircraft Structures Subjected to Kinetic Heating.** A. J. Murphy. *Royal Aeronautical Society, Journal*, v. 61, Oct. 1957, p. 653-666.

Steels and Al, Mg, Ti and Ni alloys are compared in the following respects: structural efficiency at ordinary temperatures; thermal stresses; structural efficiency at high temperature. 9 ref. (Q-general, 2-62, T24; ST, Al, Mg, Ni, Ti)

358-Q. **Irradiation of Uranium-Fissium Alloys and Related Composition.** K. F. Smith. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-5736, Sept. 1957, 55 p.

(Q26s, 2-67, T11g; U-b, *Pu*, *Mo*)

359-Q. **Irradiation Effects on Zirconium-Clad Uranium-Zirconium Fuel Plates.** R. E. Bailey. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-5825, Feb. 1958, 10 p.

(Q26s, T11g, 2-67; 8-66, Zr-b, U-b)

360-Q.* (English.) **Fatigue Fracture Criterion in Metals Based on Dislocation Theory.** Takeo Yakobori. *Tohoku University, Technology Reports*, v. 22, no. 1, 1957, p. 51-61.

With static stress it is assumed that under alternating stresses some of the dislocations are also in cyclic motion and are piled up cyclically against obstacles such as inclusions during forward and backward motion; a ductile fracture occurs and strength does not decrease appreciably. Fatigue theory is tentatively explained: the binding force on the interface between the obstacle and matrix gradually decreases or submicroscopic cracks appear on the interface during cyclic stress. 21 ref. (Q7, M26b)

361-Q.* (French.) **New Machine for Creep Tests Under High Vacuum and Low Load.** A. Gautier. *Revue de Metallurgie*, v. 55, Jan. 1958, p. 9-16.

Components and operation of machine built at French Atomic Energy Commission's research center at Saclay. (Q3, 1-53)

362-Q.* (French.) **On the Nature of Contact Corrosion Products Formed During Tension-Compression Tests on Riveted Joints in Type AG. 5 Light Alloy.** A-R. Weill. *Revue de Metallurgie*, v. 55, Jan. 1958, p. 61-66.

Abundant formation of powdery corrosion products was observed on faying surfaces of joints, whether insulated or not, during tension-compression tests. X-ray diffraction analysis revealed presence of various mono and tri-hydrated forms of alumina, although anhydrous alumina was not found. Possible damage of faying surfaces by these oxides during course of tests discussed in terms of the comparative hardnesses of these corrosion products and of the alloy studied. 8 ref. (Q28, R2; Al, 7-53)

363-Q.* (German.) **Influence of Small Quantities of Impurities on the Hot Hardness of Tungsten.** T. Millner and L. Sass. *Acta Technica Academiae Scientiarum Hungariae*, v. 19, Aug. 1957, p. 115-125.

Investigation of hot hardness by specially constructed semi-micro hardness measuring apparatus. Traces of Si in W increase its hardness at 800° C. from 180 to 250. (Q29p, 1-53; W)

364-Q.* (German.) **New Theory of Rolling.** A. Geleji. *Acta Technica Academiae Scientiarum Hungariae*, v. 19, Aug. 1957, p. 199-241.

Outline of previous theories. New theory holds that resistance to forming is equal to sum of the yield stress and the compressive stress which consists of two components. All three compressive stresses are at their maximum in neutral cross section. (Q23q, F23, 17-52)

365-Q. (German.) **Permissible Loadings of Aluminum Compression Members.** J. Weinhold. *Aluminium*, v. 34, Mar. 1958, p. 143-151.

13 ref. (Q28g; Al)

366-Q. (German.) **Development of Thick-Walled Steel Castings With High Mechanical Properties.** Hans Bühler. *Giesserei*, v. 45, Feb. 13, 1958, p. 87-92.

12 ref. (Q23s, Q23b, 3-71; AY, *Cr*, 5-60)

367-Q. (German.) **Bend Testing of OFHC Copper Wire.** H. Klatte. *Metall,* v. 12, Feb. 1958, p. 125-126.

Method of testing special high-purity Cu by annealing in hydrogen stream and wrapping around a shaft. (Q6; Cu-a)

368-Q. (German.) **Brittleness of Bright Nickel Plating.** K. H. Hartung. *Metallwaren-Industrie und Galvanotechnik,* v. 49, Feb. 1958, p. 42-44.

9 ref. (Q26s, 8-62; Ni)

369-Q.* (German.) **Determination of Notch Toughness, Fracture Appearance and Bending Angle as Dependent on Testing Temperature.** Alexander Schepers and Franz-Rudolf Licht. *Stahl und Eisen,* v. 78, Feb. 20, 1958, p. 227-235.

Determinations were made on DVM test bars taken from round bars of killed openhearth steel, and from mining channels of basic converter rimming-type steel. Assessment of brittle fracture behavior from relative bending angle and relative magnitude of percentage crystallinity in the fracture. Notch toughness value for the transition from mixed to brittle fracture. 14 ref. (Q26, Q23s, 1-54)

370-Q. (Japanese.) **Controlling Directionality of Aluminum Sheet. Pt. 4.** Takuichi Morinaga, Shigeo Zaima, Tsuneo Takahashi and Kunio Shimizu. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 43-47.

5 ref. (Q24; Al, 4-53)

371-Q. (Japanese.) **Controlling Directionality of Aluminum Sheet. Pt. 5.** Takuichi Morinaga and Shigeo Zaima. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 48-50.

Directionality is detected by the damping capacity in cantilever-type transverse oscillation. (Q24, Q8g, Al, 4-53)

372-Q.* (Japanese.) **Effect of Chromium, Iron, Silicon, Manganese or Zirconium on Properties of 52S Alloy Sheets.** Takashi Ikeno and Kizo Shibata. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 51-54.

Specimens containing less than 0.2% and more than 0.3% Cr were inferior in stress-corrosion resistance. Resistance increased with increasing Fe or Si content. Tensile strength and hardness are higher for specimens containing 0.6% Fe, but lower for those with 0.6% Si. Small amounts of Mn or Zr increase tensile strength and hardness. Casting structure becomes very fine with addition of 0.5% Zr. (Q-general, R-general, 2-60; Al)

373-Q. (Japanese.) **Effect of Manganese and Chromium on the Performance of Aluminum-Magnesium 2-5% Wrought Alloys. Pt. 1. Mechanical Properties of Sheet.** Rihei Kawauchi. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 55-77.

16 ref. (Q27a, Q23a, R-general, 2-60; Al, Mg, *Cr, Mn*)

374-Q.* (Japanese.) **Difference Between the Effect of Static and Impact Compression on the Internal Friction of Commercially Pure Aluminum.** Genjiro Mima, Riyozo Inoue and Mitsugu Tokizawa. *Light Metals (Tokyo),* v. 8, Jan. 1958, p. 88-92.

Internal friction decreased to a constant value upon standing at room temperature. Friction introduced by impact compression was greater than that by static compression, with an accelerated decrease of the former on standing. In a 15% reduced specimen, standing at room temperature for 100 min., friction caused by impact compression was several times greater than that caused by static compression. 17 ref. (Q22; Al-a)

375-Q.* **Mechanism of Creep.** *Metal Industry,* v. 92, Jan. 31, 1958, p. 88, 96.

Studies of theoretically possible creep mechanisms demonstrated that no one theory fully covers the data available, but two theories have not yet been shown to be erroneous. One suggests that concentration gradients of vacant lattice sites are set up in a creep specimen under the influence of the applied stress. Vacancies move in accordance with the gradients, setting up a net flow of vacancy causing elongation in the direction of the applied stress. The second theory suggests that the generation and movement of dislocations give rise to an observed strain. (Q3)

376-Q.* **On Kinetic Friction Between Unlubricated Metallic Surfaces.** F. F. Ling and Edward Saibel. *Wear,* v. 1, Dec. 1957, p. 167-172.

Proposes a theory of friction between unlubricated metallic surfaces in sliding contact. Coefficient of friction is found as the ratio of the shear strength to the yield pressure multiplied by a factor in which additional effects of load, relative velocity, temperature and other physical properties appear. Postulates that process of welding and fracturing of surface asperities is a unimolecular reaction. 7 ref. (Q9p)

377-Q.* **Use of Radioactive Specimens on a Kinetic Boundary Friction Machine.** R. B. Campbell and G. Harriden. *Wear,* v. 1, Dec. 1957, p. 173-182.

Modification to a kinetic boundary friction machine necessitated by the use of radioactive Cu as the smaller rubbing contact. Photographic method to detect Cu which has been transferred; quantitative assessment of autoradiography and graphical method of handling experimental results. 7 ref. (Q9p, 1-58; Cu)

378-Q. **Diagnosis and Analysis of Plain Bearing Failures.** P. P. Love. *Wear,* v. 1, Dec. 1957, p. 196-210.

Bearing failures in relation to bearing design, manufacture, assembly and use. 6 ref. (Q7, T7d; SGA-c)

379-Q.* **Alleviating Abrasive Wear in Ceramic Industry Handling Equipment.** C. M. Allen. *Wear,* v. 1, Dec. 1957, p. 232-238.

Application of wear resistant materials in plant equipment forming and fabricating ceramics. 9 ref. (Q9, T29a, 17-57; SGA-m)

380-Q. **Practical Measures to Prevent Abnormal Wear in a Steel Mill.** J. De Vries. *Wear,* v. 1, Dec. 1957, p. 239-243.

(Q9, W10a, ST)

381-Q.* **Review of Boundary Lubrication.** C. B. Davies. *Wear,* v. 1, Dec. 1957, p. 244-253.

Solid boundary lubricants, significance of physical adsorption and molecular orientation, suspensions of metal soaps and lubrication under extreme pressure. 26 ref. (Q9; NM-h)

382-Q. **Castable Ductile Metal for Strong, Complex Parts.** *Western Metalworking,* v. 16, Feb. 1958, p. 23-26.

Properties and uses of Vulcan Spherulite, a ductile iron. (Q-general; CI-r, 17-57)

383-Q.* **Engineering Properties of Metals at High Temperatures.** N. P. Allen. Paper from "Behaviour of Metals at Elevated Temperatures", Institution of Metallurgists, London, 1957, p. 3-30.

Effects of high temperatures on stability of dimensions and mechanical properties, elastic constant and coefficient of expansion, resistance to plastic deformation and fracture, behavior under fluctuation of temperature, resistance to chemical attacks. Principles involved in developing alloys having good mechanical properties at high temperatures. (Q-general, 2-62; SGA-h)

384-Q.* **Effect on Metals of Temperatures up to 450° C.** G. Meikle. Paper from "Behaviour of Metals at Elevated Temperatures", Institution of Metallurgists, London, 1957, p. 33-61.

Effects on tensile strength, creep properties, fatigue strength and corrosion resistance of Al, Mg and Ti alloys, sintered Al powder parts, Al-Ni-Fe bronze and stainless steels. Particular reference to structural materials for aircraft and missiles. 12 ref. (Q-general, R-general, 2-62, T24a, 17-57; Al, Mg, Ti, SS, SGA-h)

385-Q.* **Non-Ferrous High-Temperature Materials.** L. B. Pfeil. Paper from "Behaviour of Metals at Elevated Temperatures", Institution of Metallurgists, London, 1957, p. 67-90.

Types of Co, Ni, Pt, Mo, Cr and Ti-base alloys suitable for temperatures above 500° C. Corrosion resistance, high-temperature tensile strength, creep strength, fatigue strength, other properties. 11 ref. (Q-general, R-general, 2-62; Co, Ni, Pt, Mo, Cr, Ti, SGA-h)

386-Q.* **High-Temperature Steels.** W. B. Bardgett. Paper from "Behaviour of Metals at Elevated Temperatures", Institution of Metallurgists, London, 1957, p. 93-122.

Reviews corrosion resistance, creep strength, high-temperature tensile strength, ductility of carbon steels, low-alloy steels, intermediate steels, 12% Cr steels and austenitic steels. Relation of properties to composition. 23 ref. (Q-general, R-general, 2-62; CN, AY, SS, SGA-h)

387-Q.* (Russian.) **Changes of Mechanical Properties of Nickel-Chromium Alloys Used in Stationary and Propulsion Turbines Upon Isothermal Prolonged Heating (up to 10,000 Hr.).** V. Z. Tseitlin and G. G. Morozova. *Metallovedenie i Obrabotka Metallov,* Jan. 1958, p. 30-35.

Ni-Cr steel containing Mo and W and also Al and Ti in 1:2 ratio is very stable at 700 and 750° C. Relaxation curves indicate excellent heat resistance. Physico-chemical processes are extremely slow; alpha phase remains in the alloys even after 10,000 hr. at 750° C. Certain changes took place after 1000-3000 hr., probably due to decomposition of double carbides without, however, any practical effect upon the process of relaxation. 5 ref. (Q3; SGA-h, Ni, Cr)

388-Q.* (English.) **Fatigue Fractures and How to Avoid Them.** *Aciers Fins & Speciaux Francais,* no. 27, Dec. 1957, p. 48-57.

Nature of, factors involved in, and influence of various designs and conditions on fatigue fracture. Examples illustrate shapes and surfaces prone to fatigue fracture. Suggestions for improving endurance. 5 ref. (Q7a, 17-51)

389-Q.* (English.) **Some Experiments on the Embrittlement of Malleable**

(*)Articles Available Through Photocopy Service; See Coupon, p. 6

Iron. Pt. 2. Nobuhisa Tsutsumi. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 17-26.

Malleable iron specimens with phosphorus varying from 0.1-0.36% were held at different temperature for times up to 100 hr. to study the ductile-to-brittle transition. Results of Charpy impact tests, corrosion tests, electron diffraction examination, metallographic examination, microhardness tests, electropotential measurements of iron in ductile and in brittle states. (Q26s, 1-54; CI-s)

390-Q. (English.) **Measuring the Coefficient of Friction in Cold Strip Rolling.** Hiroshi Yamanouchi and Yuji Matsuura. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 57-62.

(Q9p, F23; 4-53)

391-Q. (Czech.) **Tests Made With Relaxation Test Block Assemblies.** Radovan Pech. *Hutnické Listy,* v. 12, no. 12, 1957, p. 1106-1108.

Methods of improving test blocks for relaxation tests including improved clamping, extension of gage length and use of polished platinum fillets with focusing grooves. Good reproducibility with method. (Q3a)

392-Q.* (Czech.) **Relaxation Testing Machines.** Radovan Pech, Petr Jehlicka, Jaroslav Sorm and Jaroslav Viso. *Hutnické Listy,* v. 12, no. 12, 1957, p. 1103-1106.

Principles of spring-loading and moving-load creep testing machines, relaxation tests made on both machines with Skoda T56 material during 1000 hr. at 500° C. and 30 kg. per sq. mm. starting stress. Results from different machines varied by only 0.6 kg. per sq. mm. (Q3a)

393-Q. (Czech.) **Tests Made With Relaxation Rings.** Jaroslav Kermes. *Hutnické Listy,* v. 12, no. 12, 1957, p. 1108-1111.

Tests made with ring of constant diameter with required stress induced into the rings by inserting a wedge. Tensometric measurements showed that the value of the stress and displacement on the circumference of the ring agree with theoretical calculations. Method compared to other creep tests. (Q3a)

394-Q. (Czech.) **Importance of Hot Stress Relaxation Study in Machine Parts of More Complex Form.** Jaroslav Nemec. *Hutnické Listy,* v. 12, no. 12, 1957, p. 1111-1115.

Importance of creep tests for calculating stress values in machine parts exposed to elevated temperatures. Principles, present theoretical state and experimental techniques for study of hot relaxation. Influence of form of complex machine parts on relaxation ratio; relation to processes existing in a complex metal structure. (Q3a)

395-Q.* (German.) **A Contribution to the Knowledge of Wear-Resistance of Bainitic-Hardened Cast Iron.** Richard G. Walzel and Hermann Ortner. *Wear,* v. 1, Dec. 1957, p. 183-195.

Structure and properties of two grades of cast iron after isothermal transformation in the tempering range of bainitic hardening. Compares wear resistance and other properties to the same grades of cast iron with a martensitic structure. Wear resistance for the lower bainitic hardening range (350° C.) is superior to normal hardened and tempered iron. 9 ref. (Q9n, N8m; CI)

396-Q. (German.) **Standardization in the Field of Wear.** H. Wahl. *Wear,* v. 1, Dec. 1957, p. 211-224.

Suggestions on standardization of definition and classification of wear. Problems in standardizing wear testing, specifically wear of metals under the influence of minerals. (Q9)

397-Q. (German.) **Slide, Wash and Blast Wear Testing.** K. Wellinger and H. Uetz. *Wear,* v. 1, Dec. 1957, p. 225-231.

Abrasive effects of granulated materials under conditions of dry or wet sliding, rinsing with a suspension or a sludge of granulated materials and blasting. Experience with reference to such variables as hardness, structure of abraded material, hardness of the abrasive, influence of moisture, temperature and the angle of the abrasive beam in blasting. Abrasion resistance of steel and white cast iron. (Q9, 1-4; ST, CI-p)

398-Q.* (Polish.) **Influence of Steel Microstructure Upon Suppression of Ultrasonic Waves.** Waclav Rozanski and Stanislaw Madej. *Hutnik,* v. 24, Nov. 1957, p. 452-457.

Damping of ultrasonic waves in solid bodies. Relationship between damping coefficient and microstructure of the medium transferring wave motion. Results of investigation of ultrasonic wave damping in annealed carbon steels. Utilization of damping phenomenon for determination of the grain size in steel. 9 ref. (Q21f, Q22, M27c; ST)

399-Q. (Book.) **Behaviour of Metals at Elevated Temperatures.** 122 p. 1957. Institution of Metallurgists, 4 Grosvenor Gardens, London, S.W.1, England. 21s.

Lectures delivered at the Institution of Metallurgists Refresher Course, 1956. Papers abstracted separately. (Q-general, 2-62)

Corrosion

225-R. Experiences With Filming Amines in Finland. Paavo Kajanne. *Corrosion Prevention and Control,* v. 4, Dec. 1957, p. 49-53.

Use of film-forming amines as internal coatings for boiler and heat transmission tubing to prevent corrosion and loosen corrosion products already formed. 16 ref. (R4c, R10b)

226-R. Influence of Insulation Design on Condensation and Corrosion. N. L. Dolbey. *Corrosion Technology,* v. 5, Feb. 1958, p. 41-44.

Poorly designed and installed insulation, especially if coated with water-resistant paint, will result in a large amount of condensation within the insulation, leading to serious corrosion problems. (R3)

227-R.* Underground Corrosion. Pt. 2. Behavior of Protective Coatings in Soils. Melvin Romanoff. *Corrosion Technology,* v. 5, Feb. 1958, p. 45-48, 56.

Results of field tests on metallic and bituminous coatings of pipes indicate that both methods are reasonably effective. The most common cause of failure was due to injury of the coating during installation of the pipe. (R8, L26a)

228-R. Chemical and Electrochemical Affinities of Corrosion Processes. Pierre Van Rysselberghe. *Corrosion Technology,* v. 5, Feb. 1958, p. 49-52, 62.

Analysis of corrosion reactions applying the concepts of chemical and electrochemical affinities, the principles of equilibrium thermodynamics and the thermodynamics of irreversible processes. (R1a)

229-R.* High Temperature Hydrogen Sulphide Corrosion in Commercial Sovaformer Units. Pt. 2. E. B. Backensto, R. D. Drew and J. N. Vlachos. *Corrosion Technology,* v. 5, Feb. 1958, p. 53-56.

Test results obtained in two commercial sovaformers show that both temperature and hydrogen sulphide are basic variables in this type of corrosion. Aluminizing provides protection from sulphide corrosion attack. Use of 18-8 Cr-Ni alloys is also suggested. (R6g, 2-62; SS, *Al*)

230-R. Two New Accelerated Corrosion Tests. An Assessment. *Electroplating and Metal Finishing,* v. 11, Jan. 1958, p. 15-16.

The acetic acid salt spray test and sulphur dioxide test in the evaluation of electrodeposited coatings. (R11; 8-62)

231-R.* Accelerated Corrosion Testing of Chromium-Plated Articles: Sulphur Dioxide Test. J. Edwards. *Electroplating and Metal Finishing,* v. 11, Jan. 1958, p. 17-22.

Apparatus and procedure. Experimental studies on varying sulphur dioxide concentration, correlation with outdoor exposure, reproducibility in different test cabinets and variation of corrosion patterns for Ni-Cr with and without undercoats of Cu or bronze and Sn-Ni on steel and other Cr-plated metals. 5 ref. (R11; 8-62, *Cr*)

232-R. Materials for Corrosion Control. Frederick W. Fink. *Industrial and Engineering Chemistry,* v. 50, Jan. 10, 1958, p. 129A-131A.

Review of literature; new corrosion problems in nuclear energy field; potentials and limitations of Ti and Zr in corrosion control. 18 ref. (R-general, T11, 10-54; Ti, Zr)

233-R. Alkaline Digester Corrosion. J. J. Wegerif. *Pulp and Paper,* v. 59, Jan. 1958, p. 104-108.

(R2g, T29r)

234-R. Prevention of Corrosion in Steam and Condensate Systems. T. B. Fielden. *Steam Engineer,* v. 27, Jan. 1958, p. 123-125.

Measures to combat steam condensate corrosion by use of filming amines. 7 ref. (R4d)

235-R. Electron Optical Studies of Oxidation Processes Occurring in High Vacuum. E. A. Gulbransen and K. F. Andrew. Paper from "1956 National Symposium on Vacuum Technology", p. 190-201, 202.

6 ref. (R1h, M21e, 1-73)

236-R.* (French.) **Lessons on Electrochemical Corrosion (Provisional Notes). Pt. 3.** M. Pourbaix. *Cebelcor, Rapport Technique no. 49,* July 1957, 65 p.

Part 3 of a series of five covering principal content of course given at University of Brussels and consisting of results of research carried on by Belgian Center for the Study of Corrosion (Cebelcor) in field of waters, electrochemistry and corrosion. Includes electrochemical oxidation and reduction; other electrochemical reactions; galvanic cells; electrochemical equilibrium diagrams of water, oxygenated water, metals and metalloids, with examples for Cu, Ag, Pb, Sn, Fe, Zn, Al and As. (R1a)

237-R. (French.) **Constitution and Morphology of the Film Formed on the Surface of Pure Iron During High-Temperature Oxidation in Steam.** Jean Paidassi and David Fuller. *Comptes*

Rendus, v. 246, Jan. 27, 1957, p. 604-607.

(R1h, R4d; Fe-a)

238-R.* (French.) **Accelerated Corrosion Tests on Chemically Passivated Electrolytic Zinc Coatings on Steel.** Tadeusz Biestek. *Corrosion et Anti-Corrosion*, v. 6, Feb. 1958, p. 59-65.

Zinc coatings passivated in 15 different solutions were subjected to five types of tests and corrosion resistance of respective samples was determined. Chemical passivation appreciably increases corrosion resistance of Zn deposits by retarding appearance of white rust and corrosion of base metal. Most effective passivating solutions are listed. 6 ref. (R10c, R11; ST, *Zn*)

239-R. (German.) **Corrosion in Primary Cooling System of Nuclear Reactors.** T. Jaeger. *Maschinenbau Technik*, v. 6, Sept. 1957, p. 495-505.

Problems caused by the induced activation of impurities in the cooling medium used in nuclear reactors. 27 ref. (R4a, W11p, 3-69)

240-R. (German.) **Corrosion of Titanium in Molten Salt Baths.** M. E. Straumanis and Y. P. Huang. *Metall*, v. 11, Dec. 1957, p. 1029-1032.

10 ref. (R6j; Ti)

241-R. (German.) **Surface and Corrosion Protection of Underground Tubes and Cables With Plastic Wrapping.** Richard Röhm. *Technische Mitteilungen*, v. 50, July-Aug. 1957, p. 38-42.

Application of Coroplast and Corothene wrapping as protection of subterranean tubes and cables in gas works, telephone installations, petroleum industry and mining; technique of application.
(R10e, T7g, 4-60; NM-d)

242-R. (German.) **Passivation and Formation of Protective Coats (on Metals) in Water.** Luigi Piatti. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 42-47.

25 ref. (R4, R10c)

243-R. Aluminum v. Corrosion by Water. E. W. Jackson. *Chemical and Process Engineering*, v. 38, Oct. 1957, p. 391-393.

28 ref. (R4a; Al)

244-R.* **Boiler Corrosion and Its Alleviation by Feedwater Conditioning. Pt. 1.** Andrew Laird and N. Reast. *Corrosion Prevention and Control*, v. 5, Feb. 1958, p. 35-38.

Survey of types of corrosion such as scab, pitting, necking, grooving, stress-corrosion and caustic cracking. (R4c)

245-R. Survey of Corrosion in Packaging. Pt. 1. D. V. Weatherley. *Corrosion Prevention and Control*, v. 5, Feb. 1958, p. 47-50.

(R10e, T10g)

246-R. New Technique for Measuring the Rate at Which a Solid Surface Is Attacked by a Corrosive Gas. *Corrosion Prevention and Control*, v. 5, Feb. 1958, p. 51-52.

New procedure at the Bureau of Standards employs time-lapse photography of the reacting solid so that a permanent record of the reaction's progress is obtained at specified time intervals. From the photographs an accurate measure of the dimensional changes and thereby the rate of change of mass of the sample can be obtained. (R11a)

247-R. Corrosion Prevention in the Bottling Industry. L. A. Johnson. *Corrosion Technology*, v. 5, Mar. 1958, p. 81-83, 94.

(R-general, L-general)

248-R.* **Accelerated High Temperature Oxidation Due to Vanadium Pentoxide.** K. Sachs. *Metallurgia*, v. 57, Mar. 1958, p. 123-136.

V_2O_5 found in residual oils used to run gas turbines causes severe corrosion of blades. Results of laboratory tests of this effect under different conditions. 41 ref. (R1h, R7e)

249-R.* (German.) **Intercrystalline Corrosion and Attack at Grain Boundaries.** Friedrich Erdmann-Jesnitzer. *Werkstoffe und Korrosion*, v. 9, Jan. 1958, p. 7-16.

Heat treated Al-Mg alloy showed intercrystalline attack depending on degree of disorientation. Lattice-energy and structure theories distinguish between fine, micro and macro angle grain boundaries. Attack caused by type and form of nonhomogeneous corings of one or more phases at grain boundaries of more than 5° but not by elastic-potential lattice energy. 31 ref. (R2h, M27f; Al, *Mg*)

250-R.* (German.) **Velocity of Dissolution of Zinc and Influence of Inhibitors Upon Decrease of Corrosive Attack in Aqueous Agents.** T. Markovic, Z. Dugi and Lj. Rubinic. *Werkstoffe und Korrosion*, v. 9, Jan. 1958, p. 17-20.

Behavior of 99.9% Zn in aqueous acid and alkaline solutions represented in corrosion current-pH diagram. Equation for inhibition of dissolution of Zn in aqueous solutions of nitric and sulphuric acid containing sodium dichromate. 20 ref. (R10b; Zn)

251-R. (German.) **Corrosion Behavior of Nonferrous Metals in Alkalimono and Alkali Hydrogen Fluorides. Pt. 2. Aluminum in Hydrochloric Acid and Sodium Hydroxide Solutions, Containing Alkalimono and Alkali Hydrogen Fluorides.** W. Köhler. *Werkstoffe und Korrosion*, v. 9, Jan. 1958, p. 20-25.

23 ref. (R6g, R6j; Al, Mg, Si)

252-R. (German.) **Inhibition of the Corrosion of Buried Iron.** T. Markovic, D. Zagar and N. Plavsic. *Werkstoffe und Korrosion*, v. 9, Feb. 1958, p. 73-75.

12 ref. (R8, R10b; Fe, 4-60)

253-R.* (German.) **Electrochemical Measurements in Corrosion Research.** V. Cupr. *Werkstoffe und Korrosion*, v. 9, Feb. 1958, p. 76-82.

Effects of corrosion and passivity on metals and alloys explained with an apparatus which allows a continuous photographic recording of potentials and currents. Measurements are based on electrode polarizations by discontinuous currents which can be modified over a wide range, and which measure the electrode potential in the dead state. Influence of capacity on polarization current and potential. 6 ref. (R11m)

254-R.* (German.) **Cathodic Protection of Buried Refinery Equipment.** P. W. Sherwood. *Werkstoffe und Korrosion*, v. 9, Feb. 1958, p. 82-86.

Corrosion in soil in which a combined action of salt water and oxygen takes place can be prevented by a protective potential generated by direct current or by galvanic cells, and must be more negative than the corrosion potential. Anodes of Mg, Zn and Al; soil conditions, measurements of electric resistance, potential differences, protective potentials, and leakage currents; location of anode installation; horizontal and vertical anodes. 5 ref. (R10d, T29n)

255-R.* (Japanese.) **Polarization Characteristics of Aluminum and Its Alloys.** Goro Ito. *Light Metals (Tokyo)*, v. 8, Jan. 1958, p. 93-106.

Polarization in chloride solution shows that the cathodic reaction is the rate-determining step and depolarization of the cathode increases the corrosion of the anode. With two dissimilar metals in contact in electrolytic solution, the corrosion current is not dependent on the open circuit potential difference but on the polarization characteristics of the couple. With Al-Cu couple in chloride solution, Cu polarizes in a more marked degree than Al and the cathode controls the corrosion reaction. Contact corrosion of Al, or various metals, with other metals can be inhibited by external e.m.f. and the potential break in cathodic polarization curve for these couples can serve as a criterion of protection. 15 ref. (R1a, Al)

256-R. (Japanese.) **Utilization of Aluminum and Its Alloys in the Wine and Brandy Industry. Pt. 1. Corrosion in Brandy.** Takuichi Morinaga, Shigeo Zaima and Motoo Kagami. *Light Metals (Tokyo)*, v. 8, Jan. 1958, p. 107-109.

11 ref. (R7f, R7b, T29p, 17-57; Al)

257-R.* (English.) **Effect of Ti, V, W and Zr on the Sulphurization-Resistant Property of Cast Iron at High Temperatures.** Masakazu Shiozawa and Hiroshi Nakai. *Waseda University, Castings Research Laboratory, Report*, no. 8, Nov. 1957, p. 13-15.

Alloy specimens were exposed to hydrogen sulphide at 900° C. for 10 hr. (R6, 2-62, 2-60; CI)

258-R.* (English.) **Corrosion Resistance of Aluminum Diffusion Coated Cast Iron to Molten Caustic Soda.** Shigetomo Ueda. *Waseda University, Castings Research Laboratory, Report*, no. 8, Nov. 1957, p. 67-71.

Extent and rate of corrosion of mild steel, 17% Cr steel, 18-8 stainless steel, cast iron and Al diffusion-coated cast iron exposed repeatedly at 270° to 330° C. to molten caustic soda. (R6j; ST, SS, CI, 8-74, *Al*)

259-R. (English.) **An Electron Diffraction Study of Stainless Steel Corroded at High Temperature. Corrosion in Atmosphere Containing NH_3 Gas.** Tadayuki Nakayama. *Waseda University, Castings Research Laboratory, Report*, no. 8, Nov. 1957, p. 77-80.

Electron diffraction patterns of the surface layers of 13% Cr and 18-8 stainless steel corroded at 700° C. by an atmosphere containing ammonia gas. (R6p, M22h, 2-62; SS)

260-R. (French.) **Historic Copper Pipe.** *Cuivre. Laitons Alliages*, no. 41, Jan-Feb. 1958, p. 41-44.

Analysis of 70-year old pipe shows little corrosion or wear.
(R-general; Cu, 4-60)

261-R. (French.) **Diffraction and Electron Microscopic Studies of Natural and Artificial Oxide Films Formed on Pure Tin and on Tinplate.** J. J. Trillat, L. Tertian and S. C. Britton. *Metaux-Corrosion-Industries*, v. 32, Dec. 1957, p. 475-481.

6 ref. (R2r, R1h, M21e, M22; Sn, 8-65)

262-R. (French.) **Corrosion in Atomic Energy Installations.** Leo. F. Epstein, H. Mogard, J. R. Weeks, C. J. Klamut, M. Silberberg, W. E. Miller, D. H. Gurinsky, etc. *Metaux-Corrosion-Industries*, v. 32, Dec. 1957, p. 490-498.

(*)Articles Available Through Photocopy Service; See Coupon, p. 62

Corrosion of stainless steel by liquid metals (sodium, bismuth-uranium, lead, lead-bismuth eutectics), and zirconium and alloys by water at high temperatures. (R6m, R4d, W11p, 17-57; SS, Zr)

263-R. (German.) **Attack of Water on Aluminum at High Temperatures.** P. Lelong and J. Herenguel. *Metall*, v. 12, Mar. 1958, p. 176-179.

Corrosion of Al investigated by metallographic examination of specimens exposed to water at various temperatures. Three main stages of corrosion are formation of a homogeneous covering layer; intercrystalline effect; and asymmetric point-like corrosion. Increasing temperature accelerates the process. (R4, 2-62; Al)

264-R.* (German.) **Causes of Rapid Rust Film Formation on Cast Iron.** G. Schikorr. *Metalloberfläche*, v. 12, Mar. 1958, p. 81-84.

Chlorine ions penetrate to graphite lamellas and remain there in spite of grinding. Depth of penetration corresponds to the the length of lamellas. A 40% relative atmospheric humidity suffices to start rusting. Almost 200 microns at superficial layer must be removed to prevent rust deposition. (R3; CI)

Inspection and Control

174-S.* **Control Analysis of Aluminum Alloys and Copper Alloys Using Self-Recording Spectrometers.** M. Milbourn and J. A. F. Gidley. *Institute of Metals, Journal*, v. 86, Jan. 1958, p. 219-224.

Quantometer for complete analysis of Al alloys, Hilger Polychromator for determining several constituents in a range of Cu alloys, and a Hilger medium spectrograph with direct-reading attachment, used on Cu alloys. Rapid, accurate analytical results on Al alloys give full compositional control of the casting process, with consequent economies in conversion costs, use of raw materials and stock handling, and with a more uniform finished product and reduced analytical effort. 4 ref. (S11k; Al, Cu)

175-S.* **Instrumentation in Ultrasonic Flaw Detection.** D. G. W. Claydon. *Institute of Metals, Journal*, v. 86, Feb. 1958, p. 241-251.

Methods of generating ultrasonic pulses and their behavior at an interface; the oil-film, immersion, and irrigation methods of coupling; design and use of probes. (S13g, 1-53)

176-S. (Dutch.) **Supersonic Examination of Material.** F. Walters. *Lastechniek*, v. 24, Feb. 1958, p. 20-22.

Material of homogeneous composition being a good sound conductor, electric oscillations transformed first into mechanical oscillations and then back into electric oscillations, travel in a straight line through the material and indicate the presence of faults, although not their exact location. Result of the examination is immediately visible or audible or both. (S13g)

177-S. (French.) **Surface Roughness Standards.** l'Abbe Cayere. *Machine Moderne*, v. 52, Feb. 1958, p. 9-15.

Surface roughness analyzed by pneumatic profilograph and compared to sets of surface roughness standards. (S15b)

178-S. (French.) **Determination of Thickness and Composition of Oxide Films on Tin and Tin Plate.** S. C. Britton and K. Bright. *Métaux Corrosion Industries*, v. 32, Nov. 1957, p. 435-442.

(S14c, S11g; Sn)

179-S.* (German.) **Thermo-Electric Measurement of Openhearth Furnace Roof Temperatures.** H. J. Kirschning, E. Hochstrate and H. Rodrian. *Archiv für das Eisenhüttenwesen*, v. 28, Oct. 1957, p. 611-614. (Translation in *Iron and Coal Trades Review*, v. 176, Jan. 1958, p. 42-44.)

The main cause of difficulties in measurement of furnace temperatures lies in the diffusion of carbon into the protective ceramic sleeves around the Pt-Rh thermocouples and subsequent changes in structure and temperature resistance. Al_2O_3, MgO, $Al_2O_3 \cdot BeO$ and ZrO_2 are compared as sleeve material; melting point, thermoconductivity, sensitivity to temperature fluctuations and corrosion resistance are given. BeO proved best for permanent and economic sleeve material. 8 ref. (S16b, W18r, X9q; Pt, Rh, RM-h)

180-S. (German.) **Use of Piacryl "SH" for Surface Examination.** S. Sohrmann. *Fertigungstechnik*, v. 8, Jan. 1958, p. 25-28.

Application possibility of a synthetic material, Piacryl "SH" pink, designed originally for dentistry. Method of application and results of experiments. 9 ref. (S15d)

181-S. (German.) **Separation of Rare Earths. Pt. 5. With Cation Exchangers.** Leopold Wolf and Joachim Massonne. *Journal für Praktische*, v. 5, Oct. 1957, p. 21-33.

9 ref. (S11f; EG-g)

182-S. (German.) **Methodology of Analysis of Graphite-Containing Cast Iron.** W. D. Gras and A. Wittmoser. *Radex Rundschau*, no. 5-6, 1957, p. 771-775.

A method of analysis of carbides in cast iron; quantitative determination of isolates and separation of most important constituents of microstructure following electrolysis. 6 ref. (S11f; ST, 14-68)

183-S. (German.) **Exposure and Determination of Oxide Inclusions in Chromium-Rich Steels and Attempts to Isolate Oxides in 18-8-Steels.** E. Piper, H. Hagdorn, H. Kern and J. Ingelin. *Radex Rundschau*, no. 5-6, 1957, p. 776-783.

6 ref. (S11f; AY, *Cr*, 9-69, 14-68)

184-S. (German.) **Statistical Investigation of Procedures for Determination of Oxide Inclusions in Steels.** E. Piper and H. Kern. *Radex Rundschau*, no. 5-6, 1957, p. 840-842.

10 ref. (S12; ST-d, *O*, 9-69)

185-S. (German.) **Photometric Determination of Antimony in Pure and Electrolytic Copper.** Charles M. Dozinel. *Zeitschrift für Analytische Chemie*, v. 157, no. 6, 1957, p. 401-405.

8 ref. (S11a; Sb, Cu)

186-S. (German.) **Application of Mathematical Statistics in Metallurgy.** Rolf Wartmann. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 11, Feb. 1958, p. 63-69.

(S12)

187-S. (German.) **Impulse Echo Testing of Plate-Shaped Materials.** Werner Grabendörfer and Josef Krautkrämer. *Zeitschrift für Metallkunde*, v. 49, Jan. 1958, p. 22-26.

(S13g; 4-53)

188-S. (Japanese.) **A Simple Method of Microdetermination of Carbon in Iron Steel and Ferro-Alloys.** Hidehiro Goto, Toshio Watanabe and Kyohei Suzuki. *Japan Analyst*, v. 6, Oct. 1957, p. 650-654.

Determination of carbon dioxide in vacuum apparatus. (S11d; ST, *C*)

189-S.* (Spanish.) **Determination of Magnesium in Nodular Castings.** Julian Bernal Nievas and Luis Serrano Berges. *Instituto del Hierro y del Acero*, v. 10, Oct-Dec. 1957, p. 389-395.

Proposed volumetric, indirect and direct colorimetric methods and results of experiments under deliberately varied conditions. Reagent used in all methods is methyl 2-8 quinolinol and prior elimination of iron is achieved by means of electrolysis with a mercury cathode. 16 ref. (S11j, S11a; CI-r, *Mg*)

190-S. **Vacuum Fusion Apparatus for Gas Analysis.** P. D. Blake. *Iron and Steel Institute, Journal*, v. 188, Mar. 1958, p. 261-264.

For determining total and fractional oxygen content of steels. (S11e, X21; ST, *O*)

191-S. **Absorptiometric Determination of Traces of Chromium in Nickel and Vanadium, of Vanadium in Chromium, and of Nickel in Chromium and Vanadium.** J. T. McAloren and G. F. Reynolds. *Metallurgia*, v. 57, Jan. 1958, p. 52-56.

(S11a; Cr, Ni, V)

192-S. **New Reagent for the Colorimetric Determination of Aluminum.** H. Green. *Metallurgia*, v. 57, Mar. 1958, p. 157-158.

(S11a; Al)

193-S. **Development of Ultrasonic Techniques for Inspecting Experimental Boiling Water Reactor Cast Uranium Alloy Cores and Fuel Plates.** W. N. Beck and W. J. McGonnagle. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-5653, Dec. 1957, 31 p.

9 ref. (S13g, T11g; U-b)

194-S.* (Czech.) **Ultrasonic Testing of Turbine and Generator Rotors.** Karel Slonek. *Hutnické Listy*, v. 13, Jan. 1958, p. 33-37.

Manual ultrasonic control for determination of important defects in rotors. Of 53 rotors tested, the ultrasonic finding was verified with eight rotors by means of cross-sections. Results show the ultrasonic method to be suitable for homogeneity control of turbine material and generator rotors. 8 ref. (S13g, T7h)

195-S.* (French.) **Contribution to the Improvement of Gamma-Ray Techniques.** P. Ruault and P. Rath. *Revue de Metallurgie*, v. 55, Jan. 1958, p. 39-52.

Gamma-ray inspection can be improved by reduction of exposure time, use of overdevelopment, better use of emulsions, reinforcement with lead screens, quality control of radiographic image. (S13e)

196-S.* (German.) **Control Techniques and Their Application in a Continuous Wiredrawing Mill.** H. Cordes. *Draht*, v. 9, Feb. 1958, p. 39-43.

Types of control; examples of application, control as a means of automatizing production. (S18, F28, 1-61)

197-S. (German.) **Bright Steel Surface.** Otto Andrien. *Industrie-Anzeiger*, v. 79, Oct. 11, 1957, p. 1235-1237.

Determination of flaws in bright steel surfaces. (S15; ST)

198-S. (German.) **Reduction of Testing Costs.** Hans Schmidt. *Werkstatt und Betrieb,* v. 91, Feb. 1958, p. 61-65.

Description and use of multiple sample testing outfits. 5 ref. (S12h, X-general)

199-S.* **X-Rays Speed Inspection of Raw Stock.** Vern W. Palen. *American Machinist,* v. 102, Feb. 24, 1958, p. 100-101.

Analysis of raw steel bar stock done more accurately and five times faster by X-ray diffraction than by chemical analysis. Specimens are cut (½ in. long), flattened and polished, and placed in X-ray spectrograph. It operates and stops automatically, measuring the time a fixed number of pulses have been reflected. (S11p; ST, 4-55)

200-S. (English.) **Segregation in Castings by Spectrographic Analysis. Pt. 4. Segregation in Copper Alloy Castings; Segregation in Aluminum Alloy Castings.** Kazuo Yasuda. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 47-53.

Local spectrographic analysis used for determining segregation in Cu-Sn or Cu-Zr alloys cast in water-cooled metal or green sand molds. Method also used on Al-Cu, Al-Mg and Al-Si alloys cooled at various speeds. (S13d, S11c; Al-b, Cu-b, 5-60, 9-69)

201-S. (English.) **Mass Spectrometric Determination of Gases in Cast Iron. Apparatus and Determination of Nitrogen.** Eiichi Kato. *Waseda University, Castings Research Laboratory, Report,* no. 8, Nov. 1957, p. 81-84.

Vacuum fusion apparatus and procedure utilizing mass spectrometer for determining gases in cast iron. Determination of nitrogen content and comparison with that obtained by chemical methods. (S11c; CI, *O, N*)

202-S. (French.) **New Apparatus for Nondestructive Continuous Metal Control.** L. Beaujard and V. Husarek. *Metaux-Corrosion-Industries,* v. 32, Dec. 1957, p. 459-468.

Electromagnetic and ultrasonic methods and applications in the iron and steel industry. (S13h, S13g, 1-52)

203-S.* (Book—French.) **Nondestructive Methods for the Study and Control of Materials.** J. L. Pignet. 280 p. 1957. Revue Optique, 3 et 5, Blvd. Pasteur, Paris 15, France.

Internal and surface examination and testing techniques, their applications, geometric and physical laws utilized, equipment employed, interpretation of results. Classic and conventional methods plus newer techniques involving use of gamma and X-rays, ultrasonics, liquid penetration, magnetic particle inspection, etc. Examples of industrial applications. (S13, S14, S15)

Metal Products and Parts

136-T. **What We Need in High Temperature Materials. Pt. 2.** A. J. Carah. *Iron Age,* v. 181, Jan. 30, 1958, p. 102-104.

Need for new high-temperature materials and methods for fabricating and joining them. (T24, 17-57; SGA-h)

137-T. **French Developments in Sintered Ceramic Cutting Tools.** Leon Gion and Louis Perrin. *Machinery,* v. 91, Dec. 20, 1957, p. 1420-1430.

Manufacture of sintered oxide ceramics and tests on the application and behavior of the material when used for cutting tool tips. Tests included the machining of various grades of steel and cast iron, and gave information on effects of various rates of feed, surface speed and depth of cut. (T6n, G17, 17-57; 6-70)

138-T.* **Where to Use the New Semiconductor Materials.** Robert K. Willardson and Theodore S. Shilliday. *Materials in Design Engineering,* v. 47, Mar. 1958, p. 114-118.

Properties and applications of high-temperature rectifiers and transistors, galvanomagnetic devices, thermistors, optical and thermo-electric devices. (T1, X25, 17-57; EG-j)

139-T. **Materials and Processes in Manufacture of Costume Jewelry.** Ralph H. Atkinson. *Metal Progress,* v. 73, Mar. 1958, p. 74-78.

Skilled artisanship and mass production are combined to satisfy a growing demand for inexpensive jewelry with a fine jewelry appearance. (T9s, 17-57)

140-T.* **A High-Strength Cast Steel.** C. G. Mickelson and R. D. Engquist. *Metal Progress,* v. 73, Mar. 1958, p. 97-98.

A low-alloy, Mn-Cr-Mo cast steel with boron and rare earth additives which can be heat treated to tensile strengths above 220,000 psi. possesses excellent ductility and impact properties plus great wear resistance in dipper teeth, chute liners and tractor shoes. (T28, 17-57, Q-general; AY, 5-60)

141-T.* **Instrument Bearings for 300° F. and Up.** Neil A. Sinclair. *Product Engineering,* v. 29, Feb. 3, 1958, p. 72-75.

Bearing materials and lubricants for high-temperature operation. (T7d, X-general, 2-62; NM-h)

142-T. (French-German.) **Venetian Blinds Made of Light Alloy Materials.** M. Spechsa. *Aluminium Suisse,* v. 8, Jan. 1958, p. 3-10.

(T10k, 17-57; Al, Mg)

143-T. (French-German.) **Aluminum in the Construction of Automatic Equipment for the Food Processing Industry.** R. Liegaut. *Aluminium Suisse,* v. 8, Jan. 1958, p. 11-16.

(T29p, 17-57; Al)

144-T. (French-German.) **Use of Movable Partitions as Office Dividers.** P. Suter. *Aluminium Suisse,* v. 8, Jan. 1958, p. 17-24.

(T26n, 17-57; Al, Mg)

145-T. (French-German.) **New Covered Parking Lot for Automobiles.** R. Vogtlin. *Aluminium Suisse,* v. 8, Jan. 1958, p. 25-30.

Design and construction details of aluminum alloy and concrete stalls. (T26n, 17-57; Al)

146-T. (French-German.) **New Aluminum Scaffolding for Construction Workers.** *Aluminium Suisse,* v. 8, Jan. 1958, p. 32-33.

(T26n, 17-57; Al)

147-T. (French-German.) **Use of Copper for Facades in Finnish Architecture.** Erkki Valve. *Pro-Metal,* v. 10, Dec. 1957, p. 911-915.

(T26n, 17-57; Cu)

148-T. (German.) **Status of Ceramic Cutting Tools.** A. Richter. *Fertigungstechnik,* v. 7, Nov. 1957, p. 489-493.

Comparison of the wear of ceramics and hard metals in machining. Ceramics have a greater resistance to temperature than hard metals and the higher cutting speed, but their manufacture is costly. (T6n, 17-57, G17; SGA-j, 6-70)

149-T. (German.) **Ceramic Cutting Tools.** E. Heymel. *Fertigungstechnik,* v. 7, Nov. 1957, p. 496-497.

(T6n, G17; SGA-j, 6-70)

150-T. (German.) **Piston Rings of Sintered Steel.** E. Baumgartl. *Fertigungstechnik,* v. 7, Nov. 1957, p. 501-504.

Piston rings of sintered steel are equal in some respects to cast iron rings, and superior to them in many others. Attempts have been made in many countries to use piston rings of sintered steel in internal combustion engines. (T21b, 17-57, Q-general; ST, 6-72)

151-T. (German.) **Titanium Carbide Hard Metals for Cutting Tools.** R. Wehner and R. Kohlermann. *Fertigungstechnik,* v. 7, Nov. 1957, p. 498-500.

TiC can be considered as the only hard metal with high resistance to wear; comparison with tungsten carbide and ceramic materials; problem of eliminating the free carbon. 10 ref. (T6n, 17-57; Ti, 6-69)

152-T. (German.) **Ceramic Tools and Their Use.** E. Heymel. *Fertigungstechnik,* v. 8, Jan. 1958, p. 2-8.

Description of various ceramics, their properties and applications. Sharpening of ceramic tools. (T6n, 17-57; 6-70)

153-T. (Japanese.) **Ceramic Cutting Tools.** Makoto Okoshi and Toshio Sata. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Oct. 1957, p. 691-696.

(T6n, 17-57; 6-70)

154-T.* **Cast Iron for Glass Molds.** R. Barton. *British Cast Iron Research Association, Journal of Research and Development,* v. 7, Feb. 1958, p. 146-156.

Composition and microconstituents of cast iron; principal properties required in cast iron used as a material for glass molds and the effect of changes in composition and structure on these properties. A straight unalloyed iron with 3.4 to 3.6% total carbon, 1.8 to 2.2% Si, 0.12% max. S, 0.45 to 0.8% Mn, and 0.4% max. P has served the general purposes of the glass industry as satisfactorily as the more elaborate irons. (T29a, 2-60, 17-57; CI)

155-T. **Metallic Materials of Construction.** M. Birkhead. *Chemical and Process Engineering,* v. 38, Oct. 1957, p. 396-398.

(T26, T29, 17-57)

156-T.* **Survey Hot-Work Tool Steels for Aircraft and Missiles.** R. J. Nekervis, C. H. Lund and A. M. Hall. *Iron Age,* v. 181, Feb. 27, 1958, p. 99-102.

General review of properties of six alloy steels with applications for aircraft and missiles. (T24, 17-57, Q-general; TS-k)

157-T. **Making Titanium Pressure Vessels.** *Metal Industry,* v. 92, Jan. 17, 1958, p. 49-50.

High-strength, low-weight pressure vessels for storage of oxygen, helium and carbon dioxide aboard supersonic aircraft and missiles have been fabricated from 6 Al-4V titanium alloy. (T24d, T26q, 17-57; Ti, *Al, V*)

158-T. **Tool Steels for Aircraft.** L. V. Klaybor. *Steel Processing and Conversion,* v. 44, Jan. 1958, p. 16-18.

(*)Articles Available Through Photocopy Service; See Coupon, p. 63

Properties of high speed toolsteels as applied to aircraft structural components. (T24a, 17-57; TS-m)

159-T.* New Steel for Hot Airplanes and Missiles. M. E. Carruthers. *Steel Processing and Conversion,* v. 44, Jan. 1958, p. 19-23.

Mechanical properties and heat treatment of Mo PH 15-7 stainless steel for missiles and hot airplane parts. (T24a, 17-57; SS, *Cr, Ni, Mo*)

160-T.* Use of Magnesium in Future Aircraft and Missile Structures. John H. Rizley and Robert E. Mihalco. Paper from "Magnesium in Perspective", Magnesium Association, p. 1300-1310.

(T24a, T24c, 17-57; Mg)

161-T. Magnesium, 2000 A. D. R. M. Brick. Paper from "Magnesium in Perspective", Magnesium Association, p. 1400-1406.

(T-general, 17-57; Mg)

162-T.* Use of Magnesium in Electronic Structures. H. R. Bullock. Paper from "Magnesium in Perspective", Magnesium Association, p. 1601-1605.

Corrosion resistance, stretch forming, design principles, material strength of Mg alloys.
(T1, A-general, 17-57; Mg)

163-T.* (Czech.) **Reasons for Short Life of Springs.** Frantisek Benes. *Hutnické Listy,* v. 13, Jan. 1958, p. 22-26.

Material defects or spring overstressing and surface defects causing fractures. Fractures in springs intended for injection pumps may be due to faulty manufacture (e.g., equipment for heat treatment, and impurities in the material); resonant vibration also contributes. In springs made of quenched wire, failures are less frequent. 10 ref. (T7c, 17-57, 9)

164-T. (German.) **Behavior of Aluminum Facades Under Earthquakes in Mexico.** H. Grathwohl. *Aluminium,* v. 34, Feb. 1958, p. 78-81.

(T26n; Al)

165-T. (German.) **Aluminum in Radar Equipment.** H. Meier. *Aluminium,* v. 34, Feb. 1958, p. 102-103.

(T1, X15q; Al, 17-57)

166-T. (German.) **Service Life of Anti-Friction Bearings.** L. Hasbargen. *Werkstatt und Betrieb,* v. 91, Mar. 1958, p. 120.

(T7d, Q9p)

167-T. (Italian.) **Aluminum in Cigarette Packaging.** *Alluminio,* v. 27, Jan. 1958, p. 20-23.

Types of Al packaging materials used in U. S. and Italy.
(T10g, 17-57; Al, 4-56)

168-T.* Corrugated Steel Foil Promises Lighter, Stronger Aircraft. Bruce Mitchell. *Iron Age,* v. 181, Feb. 6, 1958, p. 102-104.

Aircraft can either be 25% lighter, or without adding any weight, can be made to withstand aerodynamic heating to 750° F. This can be done by putting miniature corrugations in very thin sheets of high-strength stainless steel, such as 17-7PH alloy. (T24, 17-57; SS, 4-56)

169-T. Aluminum in 1958 Autos. *Light Metal Age,* v. 16, Feb. 1958, p. 12-13.

(T21a, T21c, 17-57; Al)

170-T.* Fuel Elements. *Power Reactor Technology,* v. 1, Dec. 1957, p. 21-30.

Nuclear performance, neutron absorption, dimensional stability, thermal and other physical properties of fuel elements composed of U, U-Zr, U-Cb, U-Mo, U-Si, U-Pu, Th, Th-U and uranium dioxide. Results of irradiation tests on uranium dioxide fuel elements; addition of beryllia, beryllium, ceria, silica, silicon, silicon nitride, or zirconia. Properties of fuel elements of low fuel content including U-Al, U-Zr, U-Mg and other alloys and dispersions. 22 ref. (T11g, 17-57; U-b)

171-T.* Other Reactor Materials. *Power Reactor Technology,* v. 1, Dec. 1957, p. 30-33.

Literature review outlining the mechanical properties and effect of irradiation on control material including boron alloys, cadmium and rare earth dispersions. Moderator, shielding and structural materials including graphite, lithium hydride, magnesium oxychloride, carbon and stainless steel, beryllium and magnesium alloys. 8 ref.
(T11, 17-57, 2-67; Cd, SS, Be, Mg, EG-g)

172-T. (French.) **Copper Roofing: Special Application of Leaded Copper.** *Cuivre Laitons Alliages,* no. 41, Jan-Feb. 1958, p. 11-12.

(T26n, 17-57; Cu)

173-T. (French.) **A Copper Skyscraper.** *Cuivre Laitons Alliages,* no. 41, Jan-Feb. 1958, p. 15-17.

Exclusive use of Cu for exterior and interior. Artificial Cu patina by "Cabra spray process".
(T26n, 17-57; Cu-b)

174-T. (French.) **Copper and Copper Alloys in Industry.** *Cuivre Laitons Alliages,* no. 41, Jan-Feb. 1958, p. 31-33.

(T10c, 17-57; Cu, Cu-n)

175-T. (Polish.) **Some Causes of Damages and Cracks in Rails.** Janusz Lesiecki and Jerzy Rys and Stanislaw Rudnik. *Hutnik,* v. 24, Nov. 1957, p. 457-462.

6 ref. (T23q, 9-72; ST)

W Plant Equipment

162-W. Development of Blast Furnace Tuyeres at Wheeling Steel. E. P. Quick. *Blast Furnace and Steel Plant,* v. 46, Mar. 1958, p. 307-309.

(W17g, 1-52)

163-W.* Why Metallurgy of Iron Shot Is Important. A. M. Hall. *Iron Age,* v. 181, Jan. 16, 1958, p. 84-86.

Properties sought in malleable iron shot, made from white iron, are abrasion resistance, toughness and high yield strength. These depend on the chemistry, macrostructure and microstructure of the material, all of which can be controlled. Desired characteristics are soundness, roundness, uniform distribution of graphite in compact formation, and limitation of massive iron carbide content.
(W2a, 17-57, Q-general, CI-s)

164-W. Metal Fibers Extend Life and Uses of Plastic Tooling. *Iron Age,* v. 181, Jan. 30, 1958, p. 100-101.

(W24n, 17-57, H17; NM-d)

165-W.* Recent Developments in Slabbing Mills. H. J. Kalberkamp. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 73-81.

Comparison of characteristics of the universal slabbing mill and the high-lift, two-high mill. The latter is simpler, more economical, easier to maintain and more flexible, but does not have the capacity of the former. (W23a, 1-52)

166-W.* Techniques in Rebuilding a Blast Furnace. C. F. Bessent. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 82-94.

Methods used in dismantling and rebuilding a furnace at Sparrows Point, Md., including removal of scrap and worn parts and installation of new linings and replacements. (W17g, 18-70; Fe)

167-W.* A New Quenchant for Steel. P. E. Cary, E. O. Magnus and W. E. Herring. *Metal Progress,* v. 73, Mar. 1958, p. 79-81.

A solution of polyvinyl alcohol in water gives cooling rates between those of water and oil; medium-carbon steel parts can be readily hardened with little danger of cracking. (W28p, NM-b)

168-W.* Salt Baths and Salt Bath Furnaces. Pt. 1. Haig Solakian. *Metal Treating,* v. 9, Jan-Feb. 1958, p. 4-6, 49.

Commonly used salt mixtures, heat treating applications and suitable furnace equipment for salt baths in the 300-1150° F. and the 1200-1800° F. ranges. (To be concluded.)
(W27m, W28p, 1-52)

169-W. Special Techniques in Vacuum Metallurgy. Pt. 2. Michael Rivera. *Metal Treating,* v. 9, Jan-Feb. 1958, p. 8-11.

Vacuum furnaces of the resistance, high-frequency induction and arc types. Furnace facilities for sintering and brazing; temperature control equipment.
(W18, W17, W27, 1-73, X9s)

170-W. Manufacturing Oil-Fired Air Heating Equipment. *Welding and Metal Fabrication,* v. 26, Jan. 1958, p. 2-8.

Cutting, forming and argon-arc welding, assembly procedures used to produce air heaters from stainless steel, heat resistant and mild steel. (W10e, G22, K1d; SS, ST)

171-W. A Vacuum Arc Study Chamber. E. W. Johnson and F. R. Itoh. Paper from "1956 National Symposium on Vacuum Technology", p. 170-174.

Apparatus developed to permit observation and photography of consumable electrode melting arcs for continuous periods up to 20 min.
(W18s, 1-74, X5j)

172-W. Problems Involved in Vacuum Arc Melting Furnaces and Development of These Furnaces at W. C. Heraeus GmbH. Germany. H. Gruber. Paper from "1956 Symposium on Vacuum Technology", p. 182-189.

(W18s, 1-73)

173-W. (German.) **Reel and Coil Transportation Equipment in Wire Plants and Sheet Steel Rolling Mills.** A. Hinders. *Draht,* v. 9, Jan. 1958, p. 1-8.

(W12r, W24k, W23c; ST)

174-W.* (German.) **Planning of Hot Blast Cupola Furnaces for Gray Cast Iron Foundries.** Ernst R. Becker. *Giesserei-Praxis,* no. 2, Jan. 25, 1958, p. 21-28.

Main advantages of hot blast; most economical systems; conventional and liningless furnaces.
(W18d, 1-52; CI-n)

175-W.* (German.) **Cardinal Points of Planning of Hot Blast Cupola Furnaces.** Ernst R. Becker. *Giesserei-Praxis,* no 3, Feb. 10, 1958, p. 37-42.

Construction of recuperator with dust removal by means of "ball rain". Contrivance for temperature regulation and measuring of temperature, gas pressure and gas quantity. Appliance for dust removal in foundry; utilizing of ex-

haust gas; economic importance of hot blast cupola aggregates in steel foundries.
(W18d, W13c, X9, 1-53; ST)

176-W. (German.) **Modern Tempering Furnaces.** A. Hohmann. *Giesserei-Praxis*, no. 4, Feb. 25, 1958, p. 70-72.
Outline of tempering mechanism; importance of analysis of new ores; development and construction of modern furnaces (tunnel furnaces); advantages of electrical (resistance) heating. (W27j, J29, 1-52)

177-W. (German.) **Heat Resistant Materials for Gas Turbines.** R. Krause. *Metall*, v. 11, Dec. 1957, p. 1066-1069.
17 ref. (W11m, 17-57; SGA-h)

178-W. (Italian.) **Specific Minimum Cost of a Smelting Furnace for Aluminum.** Roberto Allara. *Fonderia*, v. 6, Dec. 1957, p. 513-516.
Equations covering cost of electric power, electrodes, salts and furnace lining in terms of quintals of alloy melted, based on experimental data recorded during series of melts. (W17j, C21c, 17-53; Al)

179-W. (Portuguese.) **Mace Furnaces for Sintering Ores and Concentrates.** Tharcisio de Souza Santos. *ABM, Boletim da Associacao Brasileira de Metais*, v. 13, Oct. 1957, p. 329-347.
4 ref. (W15a)

180-W. Case for Radiant Heating in Paint Finishing Processes. F. Hunt. *Industrial Finishing (London)*, v. 10, Jan. 1958, p. 33-37.
Limitations and advantages of electric radiant heating. (W4k, L26)

181-W. Modern Development of the Ward Leonard Principle and Application in Steelworks. G. Ovens and C. A. Dodd. *Iron and Steel Institute, Journal, v.* 188, Mar. 1958, p. 266-276.
Development of variable-voltage drive with shunt motor and its application according to Ward Leonard principle; comparison between motor-generator sets and mercury-arc rectifier; closed-loop regulating system, magnetic amplifier and tension control. (W23n, 1-52; ST)

182-W. Improving Electric Furnace Refractory Life by Special Shell Cooling Techniques. V. J. Howard. *Modern Castings*, v. 33, Feb. 1958, p. 68-70.
(W17j; RM-h)

183-W. New Type of Brazing Furnace. *Welding and Metal Fabrication*, v. 25, Dec. 1957, p. 469-471.
Furnace with 20-cu. ft. capacity employs special ceramic refractory which eliminates necessity of special metal container in the controlled-atmosphere brazing or heat treatment of mild or stainless steel at temperatures up to 1500° C.
(W29m, 1-52; CN, SS)

184-W. New Automatic Grinding Machine for Fabrication Shops. *Welding and Metal Fabrication*, v. 25, Dec. 1957, p. 472-473.
Machine removes excess weld metal from vessels from 3½ to 18 ft. in diameter. (W25s, G18)

185-W.* Corrosion and Materials of Construction in the Plating Room. T. J. V. Cudbird. *44th Annual Technical Proceedings, American Electroplaters' Society*, 1957, p. 91-94.
Simple chemical corrosion, galvanic corrosion and concentration cell corrosion are three main methods of corrosion in plating room; methods to minimize them. Applications of steel, Al, Pb, Si-Fe alloy, rubber, vinyls and plastics for tanks, tank linings, exhaust ducts, and other uses in the plating room.
(W3, 17-57, R6g)

186-W. (German.) **New Ceramic Oxide-Carbide Cutting Wheel.** C. Agte. *Fertigungstechnik*, v. 7, Oct. 1957, p. 466-448.
First experiments showed best results with a grinding wheel made of 60% Al_2O_3 and 40% Mo_2C. Properties of Al_2O_3 versus carbides tabulated; advantages; preparation and evaluation of the oxide-carbide combination. (W25c, 17-57; SGA-j, 6-70)

187-W. (German.) **Using Synthetic Resins in Patternmaking.** Heinrich Kmoch. *Giesserei*, v. 45, Jan. 30, 1958, p. 72-74.
Methods, costs, comparison with wood or metal patterns.
(W19j, E17, 17-57; NM-d)

188-W. (German.) **Construction and Operation of Modern Hot Blast Cupola Plants.** Siegfried Tunder and Adam Esser. *Giesserei*, v. 45, Feb. 13, 1958, p. 92-96.
3 ref. (W18d, E10a, 1-52)

189-W. (German.) **Method of Operation and Lining of the Graphite Electrode Melting Furnace.** Karl Wagner. *Giesserei*, v. 45, Feb. 13, 1958, p. 100-103.
9 ref. (W18s, E10r, 1-52, RM-h)

190-W. (German.) **Oil-Firing of Melting Furnaces for Copper Alloys, With Consideration Given to Sulphur Effect.** Paul Buttkereit. *Giesserei*, v. 45, Mar. 13, 1958, p. 139-141.
4 ref. (W18, R7d; Cu, *S*, RM-k30)

191-W. (German.) **Comparison of LF Induction Furnaces for Billet Heating With Gas or Resistance Heated Furnaces for Heating of Nonferrous or Iron Blooms for Hydraulic Extrusion Presses.** J. Putz. *Metall*, v. 12, Feb. 1958, p. 113-122.
4 ref. (W27, F21; 4-52)

192-W. (German.) **Hydro-Cyclone, an Important Element of the Water Supply System of an Integrated Steelworks.** Alfred Köhler. *Stahl und Eisen*, v. 78, Feb. 20, 1958, p. 235-239.
(W10h, ST)

193-W.* (Japanese.) Melting Procedures for, and Properties of High-Purity Metals and Alloys. Pt. 1. Hidetake Kusamichi. *Light Metals (Tokyo)*, v. 8, Jan. 1958, p. 19-32.
An electric arc furnace with consumable electrodes made of the same material as the molten metal is suitable, not only for Ti and Zr, but for special steels as well as for heat resistant alloys. 10 ref.
(W18s, C5, D9, 1-52; Ti, Zr, SGA-h)

194-W. (French.) **Air-Coolers With Copper Heat Exchangers for Cooling Electric Power Transformers.** Edouard Laennec. *Cuivre Laitons Alliages*, no. 41, Jan-Feb. 1958, p. 35-39.
(W13b, W11f, 17-57; Cu)

195-W.* (German.) Applications, Production and Heat Treatment of Alloyed Cast Steel Rolls. Pt. 2. Materials, Use and Casting of Steel Rolls and Various Methods of Heat Treatment. Heinz Uhlitzsch and Gerhard Radomski. *Neue Hütte*, v. 3, Jan. 1958, p. 10-20.
Advantages of cast steel rolls; composition of suitable materials in relation to various purposes; appropriate methods of heat treatment; conditions and casting technique; causes of cracking and crack prevention. (W23k, 17-57, E11; ST)

196-W. (Polish.) **Automatic Loop Drive in Hot Rolling Mills.** Ryszara Hagel and Joachim Jonca. *Hutnik*, v. 24, Dec. 1957, p. 488-494.
7 ref. (W23n, 1-52)

HERE'S HOW . . .

To get copies of articles annotated in the A.S.M. Review of Current Metal Literature which are not available through the Photocopy Service.

Two alternative methods are:

1. Write to the original source of the article asking for tear sheets, a reprint or a copy of the issue in which it appeared. A list of addresses of the periodicals annotated is available on request.

2. Order photostatic copies from the New York Public Library, New York City, from the Carnegie Library of Pittsburgh, 4400 Forbes St., Pittsburgh 13, Pa., or from the Engineering Societies Library, 29 West 39th St., New York 18, N. Y. A nominal charge is made, varying with the length of the article and page size of the periodical.

Write to Metals Review for free copy of the address list

METALS REVIEW

7301 Euclid Avenue Cleveland 3, Ohio

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers: c/o A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

MELTING: GATING AND RISERING: HEAT TREATING: METALLOGRAPHY: Engineers experienced in any of these fields can find a secure, challenging and extremely interesting position with an aggressive, modern investment casting company located in the East. Please forward complete resume. Box 5-5.

METALLURGICAL, MECHANICAL, NUCLEAR, DESIGN ENGINEERS: Positions available in research, development and design and testing of nuclear reactors and nuclear power components, heat transfer equipment, gas turbines, diesel engines, turbochargers, missile components. More than 50 openings requiring applicants with B.S., M.S., Ph.D. degrees, varying from no experience to 20 years. Desirable living conditions with excellent salary program and liberal fringe benefits. Highly challenging, professional work assignments with several fine colleges for those interested in continuing their education with company financial assistance. Send resume and salary requirements to: Manager, Employee Services, Alco Products, Inc., Schenectady, N. Y.

METALLURGIST: For New England brass mill. Mature metallurgist with broad experience in brass rolling mills, will be given full responsibility for all quality control functions including chemical and physical analysis and production inspection. Also opportunity to take on broad managerial functions. Should be self-starter who can solve problems before they start. Box 5-105.

Midwest

INSTRUCTOR, PART-TIME: Opportunity to study for Ph.D. in metallurgy while teaching elementary courses in physical metallurgy and physics of materials. Applicants should have M.S. degree or its equivalent. Courses and research facilities available for chemical, mechanical and physical metallurgy, physics of solids, X-ray diffraction. Write to: Dept. of Metallurgy, The Technological Institute, Northwestern University, Evanston, Ill.

SALES REPRESENTATIVES: Old established Detroit manufacturer marketing a complete line of industrial furnaces—electric, oil and gas—specializing in gas atmospheres, wants sales representative for Buffalo and Western New York. Should have furnace experience and no competing lines. Generous commission. Write fully in confidence. Box 5-10.

RESEARCH METALLURGIST: M.S. degree. Analysis of results and mechanisms of high-temperature corrosive actions and planning for future experimentation and development with new alloys, metal-ceramics and other high-temperature protective coatings. Opportunity for collegiate teaching. Salary competitive with industry. Write to: Special Projects Division, University of Dayton Research Center, Dayton 9, Ohio.

METALLURGIST OR WELDING ENGINEER: Graduate, 25-40, with two or more years experience in metal fabrication or processing field. Cleveland Crane & Engineering Co., E. 289th St., Wickliffe, Ohio. (Phone: WH 3-3700)

TEACHING POSITION: In nuclear metallurgy as part of M.S. program in nuclear engineering. Background in one or several of the following fields also desirable: X-ray, thermodynamics, mechanical metallurgy or solid state. Research support from University or Government funds. Ph.D. degree preferred. Salary and rank open. Write: Chairman, Dept. of Mining & Metallurgy, University of Wisconsin, 1509 University Ave., Madison, Wis.

Southwest

METALLURGIST: With several years experience in aircraft process metallurgy. Salary open. Box 5-15.

West

ACADEMIC POSITION: Assistant or associate professorship open for a Ph.D. or M.S. specializing in extractive metallurgy (or chemical engineering with metallurgical experience). Salary and rank dependent on qualifications. Box 5-95.

GENERAL SUPERINTENDENT: For Southern California commercial heat treating plant. Must have metallurgical engineering background and be thoroughly experienced in operation and maintenance of heat treating furnaces (pit, batch and salt bath type), induction hardening equipment, atmosphere generators, cleaning equipment, etc. Must be able to set up processing specifications and schedule work through plant. Excellent working conditions and exceptional plant facilities. Position offers excellent opportunity for qualified man. Send complete resume stating age, marital status, health, education and past work experience. Age 35 to 48. Box 5-100.

A Lecture Series on

MATERIALS FOR NUCLEAR REACTORS

will be held at
New York University
June 9 to 13, 1958

This special one-week course for engineers will consist of twenty lectures by experts in the field, and will cover the following areas:

- Criteria for Materials Selection
- Properties of Materials for Reactor Applications
- Environmental Effects (including Radiation Effects)
- Fuel Materials and Systems
- General Problems in Reactor Component Design

Informal discussion sessions will be held, including a special panel discussion on fuel selection for commercial power development.

Registrants may enroll for single days or the full course. Dormitory space will be available. Registration will be limited. Fees: Full course, $110; single day, $35; dormitory, $2.50 a night.

For information contact Course Chairman, Dr. Irving Cadoff, College of Engineering, New York University, New York 53, N. Y. Phone: LUdlow 4-0700, Extension 215.

PHYSICAL POWDER METALLURGISTS

Required For

Challenging Research Assignments

A Senior Physical Metallurgist, preferably with Ph.D. and several years of experience is required for research work in phase diagram and isothermal transformation studies in addition to applying physical and metallurgical principles to the casting of metals, alloy development and fracture studies. Clear analytical thinking and articulate writing ability are essential requisites for this position.

A Junior Physical Metallurgist with B.S. degree and some experience or an outstanding recent graduate with excellent understanding of physical metallurgy applications plus a background in Physics or Physical Chemistry to perform phase diagram and isothermal transformation studies, investigation of fatigue and fracture, and nucleation processes.

An experienced Powder Metallurgist or an outstanding recent graduate (B.S. to Ph.D.) with outstanding background in the basic sciences and some graduate metals studies is required for a challenging Powder Metallurgy Assignment. Must have previous training or strong interest in doing work in dispersed phase activities, high temperature alloys, fiber metallurgy, cermets or nuclear fuel elements. Additional background in production of friction materials or parts helpful.

These are permanent assignments which offer an exceptional opportunity to the creative individual who desires to work on stimulating and diversified research programs which challenge the imagination and provide unusual opportunity for professional growth. We are a progressive, independent research organization offering competitive salaries, unusual freedom of activity, optimum professional associations and liberal benefits which include tuition free graduate study, outstanding vacation program, and generous relocation allowance.

SEND COMPLETE RESUME TO:
A. J. Panerai

ARMOUR RESEARCH FOUNDATION
OF ILLINOIS INSTITUTE OF TECHNOLOGY
10 WEST 35TH STREET CHICAGO 16, ILLINOIS

scientists and engineers

NUCLEAR CAREERS NOW

in worldwide reactor program

Openings at all experience levels

ANALYZE	Degree essential. Experience as required. **Preliminary analysis:** Conduct preliminary analysis and design of overall power reactor systems and components. **Shielding analysis:** Advanced studies and analysis on stationary and mobile plants. **Systems analysis:** Engineering direction on reactor plant design. **Control analysis:** Reactor kinetic and overall nuclear power plant control. Hazard analysis. Analog and digital computers. **Core analysis:** Includes criticality, temperature, void and power coefficients, control effectiveness and fuel cycles. **Stress analysis:** Structural, thermal, and dynamic stress analysis of high temperature reactor systems. **Heat transfer analysis:** Reactor systems – dynamics and thermo-dynamics of fluid flow. **Operations:** Foreign and domestic – for checkout, start-up and training.
DEVELOP	Requires related experience and applicable degree. **Instrumentation and control:** Physicists and EE's for design and development of advanced design vacuum tube, transistor, and/or magnetic amplifier control and instrumentation components. Design and analysis on reactor control systems, using stability and transient response techniques. **Fuel elements:** Metallurgists for R&D on nuclear fuel materials, including radiation effects, evaluation of uranium and thorium alloy, and ceramics. Also for mechanical fabrication development for these materials. **Nuclear fuel reprocessing:** Inorganic and physical chemists for developmental studies and experimental work. Experience with radio-active materials and high temperature processes desirable.
DESIGN	Senior openings. Degree required. Nuclear experience preferred but not essential. **Control mechanisms:** Control and safety rods, drives and allied tooling. **Reactor core components:** Moderator cans, fuel elements, core supporting structures. **Machine design:** Heavy mechanical. **Electrical:** Reactor control and power systems. **Process systems and equipment:** Pumps, Heat transfer equipment. **Facilities:** Mechanical systems. **Process instrumentation:** Reactor, auxiliary, and control systems.

Other opportunities in:
Theoretical, Experimental, Solid State Physics, Health Physics, Materials Research, Mechanical Component Development.

New programs add to years-ahead backlog

Atomics International has built and is operating two power reactors—the Sodium Reactor Experiment and the Organic Moderated Reactor Experiment. Central station power plants based on these reactor concepts are in the planning stages right now. In addition, AI has just begun an advanced power reactor study for Southwest Atomic Energy Associates, a group of 15 investor-owned utility companies.

AI is expanding overseas operations. With 5 foreign reactors already in operation or being built, AI recently signed agreements with ASEA of Sweden, which has offices in 50 countries, and DEMAG of West Germany, with whom AI formed the new company, INTERATOM, in Duisburg, West Germany.

Write today for more details about exciting career opportunities at AI.

Mr. D. E. Newton, Personnel Office, Atomics International
15330 Raymer Street, Van Nuys, California
(In the suburban San Fernando Valley, near Los Angeles)

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC.

Testing Problems?

• TENSILE • TRANSVERSE
• COMPRESSION • SHEAR

A DILLON UNIVERSAL TESTER
will solve them all!

You can make *any* workbench a testing area with a DILLON Model L Bench Tester. This low cost instrument precision-checks metal, plastics, wire, rubber, springs, etc. Operates in tensile, compression, transverse or shear! Handles round, flat or special shapes. Hand wheel or motorized. Equipped with max. indicator. 7 interchangeable gauges. For materials up to 125,000 lbs. PSI tensile. Wide range of gripping fixtures. Also available on stand.

MODEL L

MODEL M

Write TODAY for brochures and LOW price schedule

FOR EXTREMELY DELICATE MATERIALS
Model M for low strength specimens between 0 & 300 lbs. Meets ASTM & Fed. specs. Pendulum principle. Has 5 scales.

W.C. *Dillon* & CO., INC.

14576G Keswick St. • Van Nuys 15, Calif.
(Suburb of Los Angeles)

●

PHYSICAL METALLURGIST OR PHYSICAL CHEMIST

Research on high temperature refractory metals and alloys. Studies of physical diagrams and solid state reactions. Knowledge of dilatometry and X-Ray techniques useful. Desire B.Sc., M.Sc. or Ph.D. degree.

Send complete resume to Mr. Hugh R. Boyd, Administrative Manager, Research Division at address below.

RAYTHEON

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

Waltham 54, Massachusetts

TEN NEW POSITIONS FOR METALLURGICAL & WELDING ENGINEERS, METALLURGISTS WITH NUCLEAR DIVISION

COMBUSTION ENGINEERING INC.,

WINDSOR, CONNECTICUT

MISSION: DEVELOPMENT/FABRICATION OF NUCLEAR PROPULSION PLANTS FOR NAVAL APPLICATION.

FIELDS:

(1) MATERIALS DEVELOPMENT—Providing new materials, techniques, processes in the fabrication of fuel elements and reactor cores.
METALLURGICAL ENGINEERS (3)—Interested in project-type activities—goal Reactor metallurgy . . . . qualified to present reports . . . one to two years experience . . . High Temperature Metallurgy—specific applications, reactor technology, plan, supervise R. & D. programs aimed at developing reactor components for high temperature systems. Five years experience. Ph. D. preferred. Core manufacturing support. Determine problem areas, set up programs to improve quality, reduce costs. Six years experience process development or fabrication prefer 3 AEC field. Master's preferred.

(2) CORE MANUFACTURING—Fabrication of Fuel Elements and Cores. Project Engineers (2) Establish, maintain technical liaison between development and quality control. Reports, procedures. Four years metal fabrication experience. DEVELOPMENT ENGINEER (1) Design, develop new inspection instruments, methods, applying same to inspection requirements. Four years industrial or R. & D. experience. PROCESS ENGINEERS (3) Organize, Execute development programs. Determine machine requirements, specifications. Design jigs, fixtures. Assist in training production operators. Write specifications, procedures, reports. Experienced metal working and fabrication.

(3) POWER PLANT—Technical Advisory, Quality Control. WELDING ENGINEER (1) Assist with all phases of welding to assure soundness, quality. Evaluate, approve design of component weldments, selection of materials, welding, cladding procedures, stress relieving, heat treatments, qualification tests and assure adequate non-destructive inspection. Three years experience shop or laboratory.

Advantages:

Privately Owned Facility
Graduate Program Hartford Center, Rensselaer Polytechnic Institute.
Reactor Technology/Training
New Expanding Division of Established Company

Requirements:

Bachelor's Degree unless otherwise specified.
U. S. Citizenship

Send Resume to:
Frederic A. Wyatt
Combustion Engineering Inc.
Windsor, Conn.

Metallurgists and Physical Chemists

Interesting Opportunities
In The Field Of
Liquid Metal
Fuel Reactor Systems
exist at a laboratory engaged in
FUNDAMENTAL & APPLIED RESEARCH ON NUCLEAR REACTOR COMPONENTS

PHYSICAL CHEMISTS
For Research And Development On Graphite, And Materials Problems

METALLURGISTS
For Work On Materials Research
Liquid Metal Technology
Metallography and Effects of Radiation on Materials
Candidates Should Have An Advanced Degree Or Exp.
SEND COMPLETE RESUME TO EMPLOYMENT SUPERVISOR

●

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
UPTON, L. I., N. Y.

POSITIONS WANTED

METALLURGIST: Employed. Seventeen years experience, five years in electroplating, writing specifications, supervising test laboratory, 12 years casting, extruding, heat treating and fabricating aluminum and brass. Seeking position of responsibility with a growing concern. Prefers Northern Midwest or West. Resume on request. Box 5-20.

METALLURGIST: B.S. from University of Birmingham, England, seeks employment in nonferrous research anywhere in U. S. or South America, to start July. Has worked in Canada and France, extrusion research at University. Age 25. Box 5-25.

METALLURGICAL ENGINEER: B.S. degree, age 28, married. Seven years diversified experience in ferrous and nonferrous metallurgy. Experience includes failure analysis, research and development, material evaluation, material specification, inspection, quality control and consulting in petroleum and chemical industry, U. S. Army Ordnance, diesel engine industry. No preferred location. Resume on request. Box 5-30.

METALLURGIST: With 14 years experience. B.S. degree. Broad background in selection and evaluation of materials, laboratory testing and analysis, heat treating, plating, organic finishing, quality control, failure analysis, research and development, and supervision. Prefers East. Box 5-35.

GROUP LEADER: Nine years diversified experience in field of metallurgy. Experience in white metals refining, powder metallurgy, wire drawing, vacuum melting and casting, heat treating, rolling, forging and electroplating. Supervisory experience as foreman, assistant plant superintendent and group leader. Production and research experience. Desires position as chief engineer or group leader. Registered professional engineer. Box 5-40.

PHYSICAL METALLURGIST: General engineering background plus M.S. in physical metallurgy, age 27, veteran. Four years diversified experience in research and development of refractory metals and alloys. Detailed resume on request. Box 5-45.

ENGINEERING SALES: B.S. in metallurgical engineering, family man. Strong sales aptitude. Experience includes 10 years general selling and six years engineering. Working knowledge of tungsten and molybdenum for lamp and electronic applications. Will travel and relocate. Resume available on request. Box 5-50.

METALLURGICAL ENGINEER: Age 31, family. Desires challenging position in charge of laboratory in progressive organization. Has experience in all types of ferrous heat treatment, including selection of equipment and metallurgical cost reduction. Complete resume upon request. Box 5-55.

PHYSICAL METALLURGIST: Metallurgical engineering degree with advanced studies. Married, family, veteran. Experienced in research and development, several papers. Exceptionally broad experience in machine tools, and experience in development of new alloys, corrosion, fabrication. Seeks position of challenging nature with opportunity for administrative experience and advancement. Will relocate. Resume on request. Box 5-60.

RESEARCH METALLURGIST: British, age 27, seeks post with American or Canadian research team engaged on research in titanium, zirconium, beryllium, columbium, etc., as no suitable alternative position is available in England. Several years research in this field. Taking advanced degree this year. Box 5-65.

EXECUTIVE ENGINEER: With 20 years diversified experience in financial, sales, engineering and production in the metal industry, light and heavy fabrication, and machine tool operation in the large appliances and environmental equipment fields, heavy ordnance operations. Box 5-70.

METALLURGICAL TECHNICIAN: A.A.S. in metallurgical technology, age 20, single. One year experience in research field dealing with the physical metallurgy of reactive metals, basically titanium and columbium. Experienced in metallography, melting and rolling techniques, physical testing, physical measurements and heat treating. Willing to relocate. Resume on request. Box 5-75.

METALLURGIST: B.S. degree, age 32, married, veteran. Competent metallographer with laboratory and customer service experience. Three years in process engineering, three years in research and development, currently employed in atomic energy plant. Desires position offering opportunity to learn while earning in Eastern Pennsylvania or New Jersey. Box 5-80.

RESEARCH METALLOGRAPHER: Excellent background in photography with 13 years application in metallurgical field. Interested in position with research organization where ability can be put to good use. Detailed educational and industrial experience resume will be furnished on request. Box 5-85.

QUALITY CONTROL MAN: With background in chemical engineering and metallurgy and wide experience in foundry and manufacturing fields, desires responsible position with progressive company in east. Age 62, energetic, capable, in good health, available after 41 years as resident material inspector of a railroad, due to drastic cuts in personnel. Box 5-110.

METALLURGICAL ENGINEER: Broad background in metallurgical processes and engineering. Ten years chemical and metallurgical laboratories; five years fully responsible field erection and operations engineer with major manufacturer of special highly automated heat treat furnace equipment. Heavy experience initiating and improving ferrous metallurgical processes. B.S., Ch.E. degrees, family. Will relocate. Limited travel. Resume on request. Box 5-115.

MANAGERIAL POSITION: In manufacturing or engineering fields, preferably in metal processing, fabricating or shaping. Can assume responsibility for laying out a manufacturing plant, ordering equipment, hiring a nucleus of trained foremen, hiring and training direct labor and setting up departments to handle standards, scheduling, quality control, engineering and maintenance. Box 5-120.

FATIGUE DURABILITY OF CARBURIZED STEEL

What factors determine fatigue durability in carburized steel? Why do some carburized steels withstand more stress than others? You can find out in this just-off-the-press book on **Fatigue Durability of Carburized Steel.** 123 PAGES.

Five authorities established as their goal a better understanding of the interrelation of factors that determine fatigue durability. They state their goal clearly, describe the research and testing accomplished, and finish with a declaration of definite conclusions. This is the story of a question and an elusive, but finally captured, answer.

The book is divided into five sections to enable thorough coverage of the subject matter. Beginning with a review of prior efforts dating as far back as 1860, the authors smoothly and capably document each phase of the search for a better understanding of factors influencing fatigue durability.

For men who specify, design, produce, or use components of carburized steel, **Fatigue Durability of Carburized Steel** gives valuable information and numerous enlightenments that will aid in determining the most effective applications. As a reference, you will reach for it again and again. Help yourself to a more comprehensive understanding of **Fatigue Durability of Carburized Steel.** Read this up-to-the-minute account of fatigue durability that will give you sound reasons for selecting or using particular grades of carburized steel.

$4.00 POSTAGE PAID.

CLIP AND SEND TO ASM
TECHNICAL AND ENGINEERING
BOOK INFORMATION SERVICE
7301 EUCLID AVE., CLEVE. 3, OHIO

METALLURGICAL SUPERVISOR

An imaginative physical Metallurgist, preferably Ph.D., is required for Technical and Administrative direction of a group involved in development of high-temperature and special purpose alloys.

Salary commensurate with experience, exceptional employee benefits. Located in Midwest Metropolitan area.

All replies will be treated confidential.

Send complete resume to:

BOX 5-90, METALS REVIEW

DUCTILE CHROMIUM
376 PAGES

If you produce, extract, test, fabricate, design, or use metals in any way, this report of 49 experts on chromium can give you the most up-to-date and accurate information available today. Entirely new fields of usefulness for chromium and its alloys are forecast in this well-illustrated volume of proceedings at the important conference on Ductile Chromium co-sponsored by the Office of Ordnance Research, U. S. Army, and the American Society for Metals.

More than twenty years of intensive research in the United States, Europe and Australia have been devoted to the development of chromium-base alloys for high temperature service. Learn of the significant work on the extraction, fabrication and properties of a metal that is a most promising base for new alloys of superior oxidation resistance and strength at elevated temperatures.

The book's 27 chapters are presented in five sections. Section 1 provides a general review of research on chromium. Section 2 deals with the production of chromium metal. Section 3 discusses ductile chromium metals, with Section 4 devoted to the effect of gas on chromium metal, and Section 5 reports on high-chromium alloys.

Here is an opportunity for you to explore the many new applications for chromium. Be an authority on ductile chromium — over one million tons of chromite ore are consumed annually in the United States! Take advantage of this chance to learn what 49 authorities know about this increasingly important metal.

$8.50 POSTAGE PAID
CLIP AND SEND TO ASM
TECHNICAL AND ENGINEERING
BOOK INFORMATION SERVICE
7301 EUCLID AVE., CLEVE. 3, OHIO

furthering creative technology at

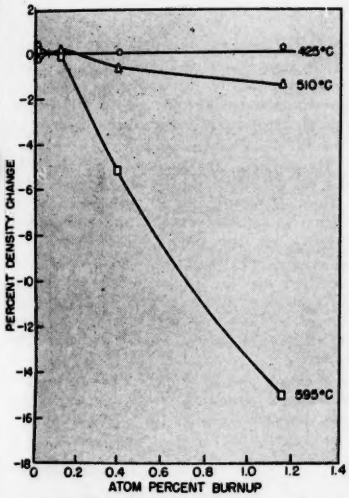
The KNOLLS ATOMIC POWER LABORATORY

The significant relationship between advances in materials and processes, and advances in nuclear propulsion systems has generated a continuous program of original investigations in metallurgy and ceramics at The Knolls Atomic Power Laboratory.

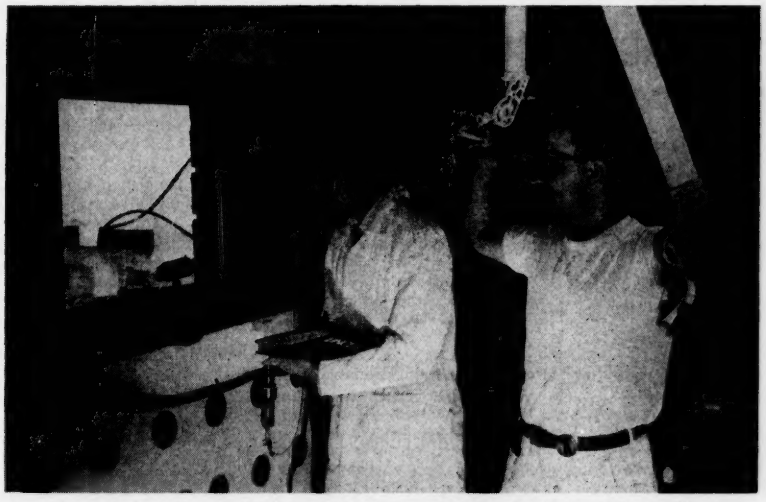
Currently the Laboratory is working toward the design of power reactors for operation at higher temperatures and with higher fuel burnups. A typical materials problem is the swelling and blistering of fuel elements caused by the agglomeration of inert gases (Kr and Xe) formed during nuclear fission.

• • •

An example of the physical-metallurgical studies now under way in this area is the experimental work described below.



DENSITY CHANGES IN ZIRCALOY CLAD 8 w/o URANIUM-ZIRCONIUM ALLOYS ON POSTIRRADIATION ANNEALING



Dr. W. V. Johnston (left) recording data at post irradiation annealing cell.

POST-IRRADIATION ANNEALING OF URANIUM-ZIRCONIUM ALLOYS

To obtain information on the agglomeration mechanism and the extent of damage experienced, specimens of an 8 wt % enriched uranium-zirconium alloy which had been irradiated to a maximum of 42% of the U-235 atoms fissioned were annealed in vacuum furnaces at 425, 510 and 595°C. Percent density changes were determined as a function of temperature at an annealing time of 500 hrs. As can be seen in the graph, specimens of all burnups were stable at 425°C but volume increases of up to 15% were obtained at 595°C.

Additional information on the amount and rate of Kr and Xe diffusion and release from the fuel elements has been obtained by using β and γ counting techniques. The effects of irradiation and annealing on the temperature of phase transformations and on alloy structures are being studied by measurement of electrical resistivity, and use of advanced metallographic techniques.

PROFESSIONAL OPPORTUNITIES

There are openings at the Laboratory for metallurgists and ceramists interested in development, application and fabrication of nuclear core materials. Degree is required; advanced degree and/or related experience preferred. (U.S. Citizenship) If you qualify, please send resume, including salary requirement, to: Mr. A. J. Scipione, Dept. 41-MQ.

Knolls Atomic Power Laboratory
OPERATED FOR A.E.C. BY
GENERAL ELECTRIC
SCHENECTADY, NEW YORK

LEARN FROM AN EXPERT

PREPARE FOR A BETTER JOB AND MORE PAY IN THE HEAT TREATMENT OF STEEL

GEORGE F. MELLOY

George F. Melloy, author of Course 10—Heat Treatment of Steel—has been with the Bethlehem Steel Company for fifteen years. At present he is a Research Engineer. Throughout his affiliation with Bethlehem, Mr. Melloy has been engaged in various capacities in the Specifications and Experimental Departments. He spent twelve years establishing heat treatment procedures for new steels. He is a graduate of Lehigh University with a degree in Metallurgical Engineering and has been an instructor at the Bethlehem Center of the Mineral Industries Extension Services, Pennsylvania State University.

Hence, Mr. Melloy's work on this outstanding course is backed by long years of experience in the field. He has taken the guesswork and uncertainty out of heat treating so that you may go at your work with greater self-confidence and, in doing so, take a tighter grip on success.

TO MEN OF METALS:

W. H. EISENMAN
Secretary
American Society for Metals

Course 10, Heat Treatment of Steel, is another fine example of the authoritative, up-to-the-minute home study courses now being offered by the Metals Engineering Institute. The important material it contains, according to letters received from MEI students, does an outstanding job in preparing ambitious men for successful careers in heat treating. And for good reason.

The Metals Engineering Institute is a division of the American Society for Metals. This is of vital importance to you personally. It means that you, as a student of MEI, receive all the benefits of ASM's forty years' experience in educational success in the metal industry.

Throughout these years, ASM Chapters all over the country engaged in training sessions and class instruction that brought metals engineering knowledge to men of metals engaged in all kinds of metalworking occupations. It was ASM's responsibility to do so . . . because ASM is an *educational* society.

The courses offered by the Metals Engineering Institute are another step in the work ASM Chapters have been doing for four decades—but much extended in scope and material. MEI places ASM's educational program on a much higher, more encompassing level. Now it is possible for any man or woman in the metal industry who wants more knowledge on metalworking subjects to use thoroughly prepared, authoritative and up-to-date courses.

MEI is well founded. Its policies are governed by the MEI Board of Governors, made up of ASM officers and trustees. The MEI National Advisory Council, made up of past-presidents of ASM, advises in the selection of course subjects and authors and provides objective viewpoints for the objectives of MEI.

Every man who helped create MEI, and every man who helps direct MEI today, is devoted to the advancement of metals through education. One of these men is Dr. Anton de S. Brasunas, Director of MEI. He, as in all other cases, was chosen after careful consideration of all qualifications. MEI is backed by metals authorities—by *experts*.

I am confident that these home and in-plant study courses will provide the helpful, authoritative guidance to supply the skilled technical manpower required today—and in the years ahead.

W. H. EISENMAN, *Secretary*
American Society for Metals

12 COURSES AVAILABLE NOW FOR HOME STUDY AND IN-PLANT TRAINING

- Elements of Metallurgy
- Heat Treatment of Steel
- High Temperature Metals
- Metals for Nuclear Power
- Gray Iron Foundry Practice
- Steel Foundry Practice
- Titanium
- Stainless Steels
- Oxy-Acetylene Welding
- Electroplating and Metal Finishing
- Survey of Steel Plant Processes
- Primary and Secondary Recovery of Lead and Zinc.

Metals Engineering Institute

This certifies that

(Your name here)

has satisfactorily completed the Home Study Course entitled

"Heat Treatment of Steel"

under direction of Metals Engineering Institute, a division of American Society for Metals, and in testimony thereof has been awarded this

Certificate

this 15th day of October, 1958

under the seal of American Society for Metals

at Cleveland, Ohio.

Issued by Metals Engineering Institute

Secretary

Director

THIS MEI CERTIFICATE CAN BE YOURS

CHECK AND MAIL TODAY . . . NO OBLIGATION

Metals Engineering Institute
7301 Euclid Avenue
Cleveland 3, Ohio

☐ I am interested in Course 10, Heat Treatment of Steel. Please send me additional information at once.

☐ I may be interested in other MEI courses. Please send me full information about those courses I have checked at the right.

THESE COURSES ARE AVAILABLE NOW

- ☐ Elements of Metallurgy
- ☐ Heat Treatment of Steel
- ☐ High Temperature Metals
- ☐ Titanium
- ☐ Metals for Nuclear Power
- ☐ Stainless Steels
- ☐ Electroplating and Metal Finishing
- ☐ Gray Iron Foundry Practice
- ☐ Oxy-Acetylene Welding
- ☐ Steel Foundry Practice
- ☐ Primary and Secondary Recovery of Lead and Zinc
- ☐ Survey of Steel Plant Processes

THESE COURSES WILL BE AVAILABLE JUNE 1, 1958

- ☐ Copper, Brass and Bronze
- ☐ Magnesium
- ☐ Tool Steels
- ☐ Fundamentals of Ferrous Metallurgy
- ☐ Arc Welding
- ☐ Blast Furnace Operations

There is no obligation on my part in the return of this coupon.

Name ..... Title .....

Street and No. .....

City ..... Zone ..... State.....

Co. .....

MR558

INSTITUTE OF METALS MONOGRAPHS

THE NON-DESTRUCTIVE TESTING OF METALS

By R. F. Hanstock

Demy 8vo. Pp. 172, Illustrated. $3.50, post free

THERMODYNAMICS OF ALLOYS

By J. Lumsden

Demy 8vo. Pp. 400, Illustrated. $5.50, post free

PROPERTIES OF METALLIC SURFACES

A Symposium

Demy 8vo. Pp. 368, Illustrated. $5.50, post free

THE MECHANISM OF PHASE TRANSFORMATIONS IN METALS

A Symposium

Demy 8vo. Pp. 346, Illustrated. $7.50, post free

Obtainable through booksellers or direct from

THE INSTITUTE OF METALS, 17 BELGRAVE SQUARE, LONDON, S.W. 1.

(Checks on American banks accepted)

A. S. M. PHOTOCOPY SERVICE

A.S.M. Photocopy Service is available only for articles identified by an asterisk in the A.S.M. Review of Metal Literature. For articles not marked with an asterisk, please refer your request to either the Engineering Societies Library in New York, the John Crerar Library in Chicago, or the Carnegie Library in Pittsburgh.

Please order by item number immediately preceding the asterisk. Payment of $1.00 per page or fraction thereof is requested in advance (number of pages is shown in the journal reference). Where advance payment is not feasible, a surcharge of $1.00 is made to cover billing costs.

All photocopies will be provided in the form of positive paper prints of normal size.

In offering this service the American Society for Metals attempts to follow the "fair use" interpretation of the copyright law. A.S.M. therefore does not sell the photocopies but merely performs the service of copying. The applicant for this service must agree to the following conditions:

1. Not more than one copy of any work is requested.
2. The photocopy is requested solely for personal use in research and study.
3. The applicant will not publish or further reproduce the material without first securing the permission of the copyright owner.
4. The applicant will hold the A.S.M. harmless from any claim that may arise from supplying him with the photocopy.

Photocopy Service Order Form

A.S.M. Photocopy Service
7301 Euclid Ave.
Cleveland 3, Ohio

Please send me one photocopy each of the following documents (which are identified by an asterisk in the A.S.M. Review of Metal Literature):

Item No.	No. of Pages	Cost at $1.00 per page
	Total Cost	

Payment is enclosed_____

Please bill me and add $1.00 to cover billing costs_____

I agree to the terms specified above as to "fair use" under the copyright law

_____
Signature

Name _____
(Please Print or Type)

Address _____

Company _____

Street _____

City_____ Zone____ State____

PROGRESS THRU RESEARCH = MONEY MAK-ERS PRODUCTS FOR INDUSTRY

Research is fundamental to progress and profits.

Research results in satisfied customers.

Research creates the standards for purchase of chemicals and additives necessary for quality heat treatment.

PROVEN HOLDEN DEVELOPMENTS

1. Holden Additives: #10, #11, and #12 used in neutral salt baths, 1000-2300° F.
2. Holden Marquench 296: used as a quenching salt for martempering and austempering; chloride sludges are easily removed.
3. Holden non-explosive Tempering salt bath, 700-1200° F.
4. Holden water soluble Liquid Carburizing salt baths.
5. Holden Hy-Speed Case for nitriding high speed tools.
6. Holden pressure Nitriding process for Nitralloy and Stainless Steel.
7. Holden AIR COOLED SALT POT RING *increases alloy pot life 100-300%.*
8. Holden Marquench unit with positive circulation and positive chloride separation section.
9. Holden Electrode Salt Bath Furnaces with steel or ceramic pots. This Holden built-in electrical system equals PLUS VALUES in electro-motive stirring action. Temperature uniformity plus or minus 2½° F.
10. Holden Automation Systems for Salt Baths,—*transfer time 6 to 15 seconds.* OPERATING and FLOOR SPACE *savings up to 30%.*

WRITE FOR FREE LITERATURE

_____#200 Holden Salt Baths. _____#203 Rubber Mold Cleaning, Paint Removal, Descaling and Desanding.
_____#204 Pressure Nitriding. _____#205 Industrial Furnaces. _____#206 Austempering-Martempering.
_____#208 Holden Lease Plan. _____#207 Recirculating Radivection Furnaces. _____#209 Instantaneous Heating.

SEE INSIDE FRONT COVER FOR INVITATION TO INSPECT

THE A. F. HOLDEN COMPANY

3 F.O.B. Points for Holden Metallurgical Products

EXECUTIVE OFFICES AND PLANT
• 14341 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN

EASTERN PLANT
• 460 GRAND AVENUE, NEW HAVEN 13, CONN.

WESTERN PLANT
• 4700 EAST 48th STREET, LOS ANGELES 58, CALIF.